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This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustration, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth, and other parts of the world in which Canada has special interest.

The British standard of spelling is adopted, substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1929.

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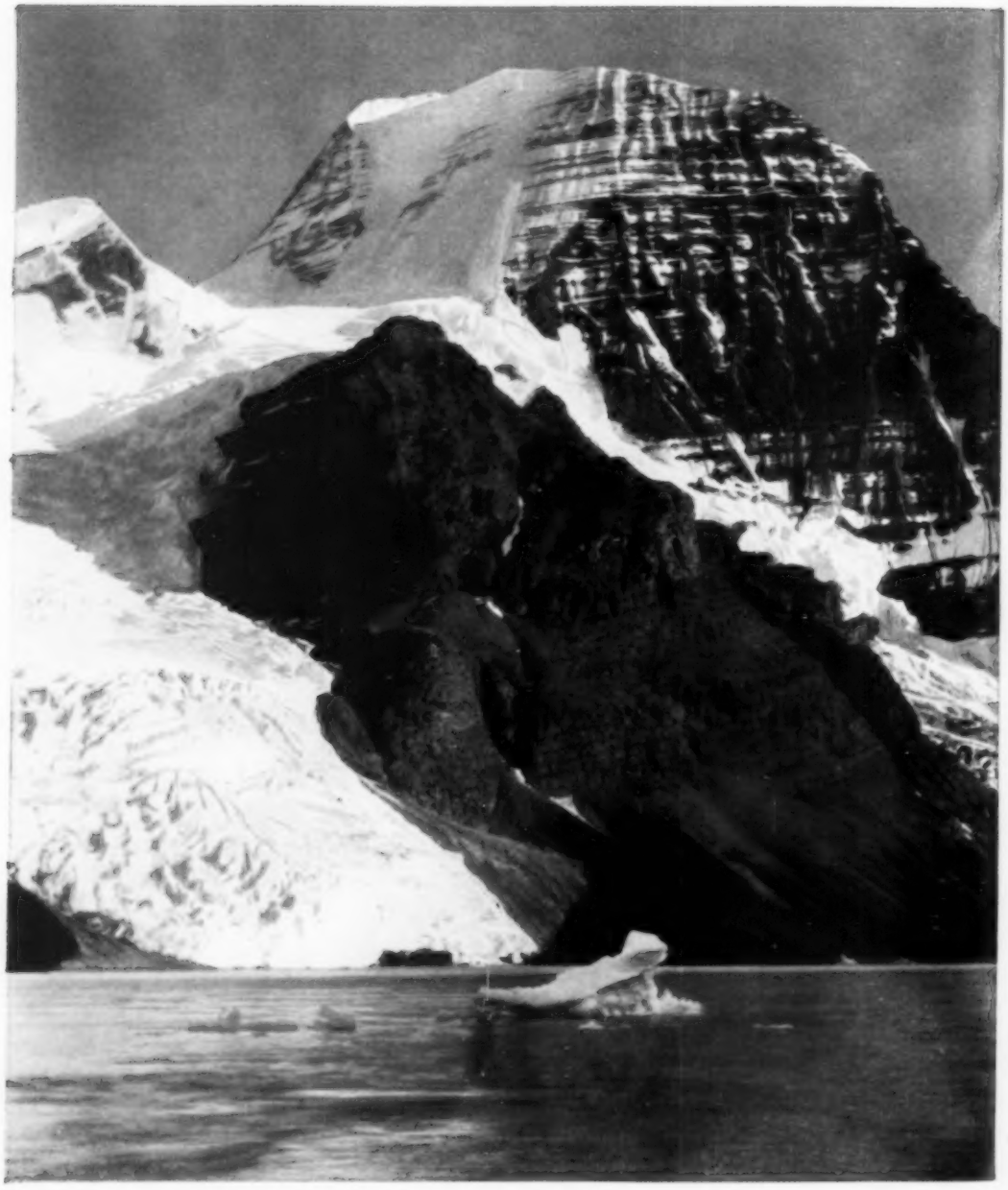


From a photograph.

Mount Robson, Jasper National Park.

Canadian Geographical Journal

Jasper National Park

By R. W. CAUTLEY

JASPER PARK is the most northerly of the two great mountain areas in Alberta which have been set aside as National Parks of Canada under the Department of the Interior. It is the largest of all National Parks on the North American continent, containing more than two and a half million acres.

Extending along the summit of the Rocky Mountains for more than 200 miles, it joins Banff Park at the height of land which divides the waters flowing into Hudson Bay from those flowing into the Arctic Ocean.

The name Jasper was well chosen. It is associated in one's mind with Chalcedony and other rich and rare-sounding things, but in this instance takes its origin from a certain inconspicuous servant of the North West Company named Jasper Hawes, who was one of the pioneers of the district.

R. W. CAUTLEY

who is Acting Chief of Control Surveys, Topographical Survey of Canada, writes of Jasper Park from a vast knowledge gained at first hand. As a member of the Interprovincial Boundary Commission, Mr. Cautley was engaged for 12 years on the survey of the boundary between Alberta and British Columbia. He also spent some years on special work in connection with National Park boundaries in the course of which he made extensive journeys through the lesser-known parts of the parks.

The first white man who is known to have penetrated this region was David Thompson, in 1810. Thompson was one of the greatest of all the heroic explorers who discovered Canada in the interests of the fur trade. More than that, he was a first-class geographer and made the first general map of the greater part of Canada, much of the material for which was drawn from his own explorations.

There is perhaps no more thrilling story in the fascinating annals of early exploration than that of Thompson's entry into Jasper Park country. In September, 1810, Thompson prepared to take a large supply of goods across Howse Pass in the Rocky Mountains to develop the trade which he had already established with the Kootanae Indians of the Columbia in 1807. However, the Piegan Indians on the east side of the Rockies, although otherwise friendly, had always taken strong objection to Thompson trading with their Kootanae enemies, and on this occasion sent out a war party to waylay the passage of his canoes up the Saskatchewan.

Upstream from the Indians were Thompson's pack horses and men, waiting to pack the goods across Howse Pass. Downstream were the loaded canoes. Thompson sent men up towards the Pass with instructions to bring all the horses to where the canoes were by some land trail far enough from the river to avoid contact with any of the Indian hunting parties. Having successfully performed this by-no-means easy piece of strategy, Thompson, instead of retiring to Winter quarters at one of the Forts lower down the river, deliberately started north through the woods on October 28th, without food, with no trail and with the probability of being caught by hostile Indians, to take his goods through an unknown Pass in the dead of Winter. The party reached Athabaska River on November 29th and made the first recorded crossing of Athabaska Pass on January 10th, 1811, subsequently reaching Columbia River on January 26th.

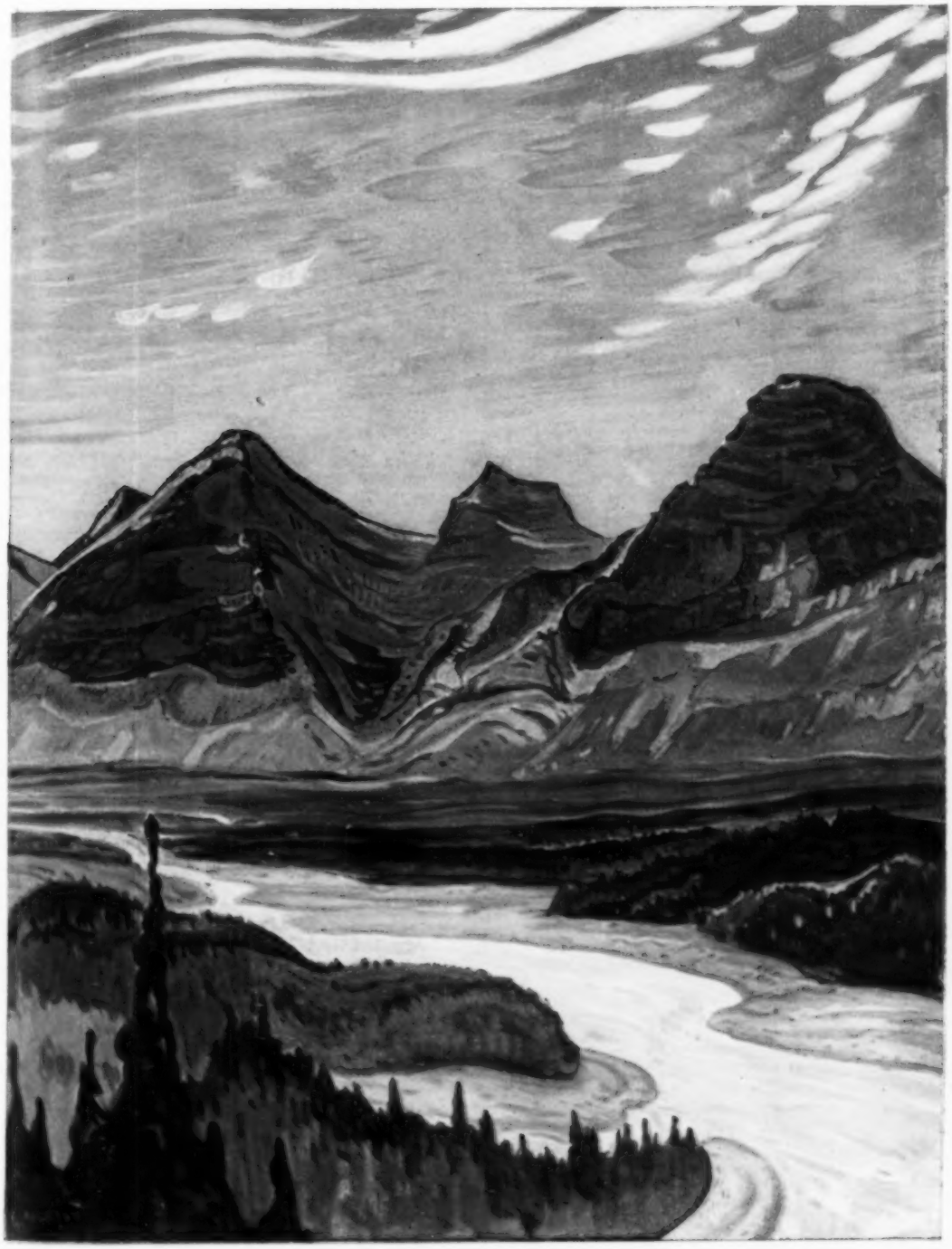
The pretty town of Jasper, 235 miles west of Edmonton on the Canadian National Railways, is the centre of tourist travel, and indeed the only permanent settlement of any kind within the Park.

Three miles out of town, on beautiful Lake Beauvert, the Canadian National Railways system has built Jasper Park Lodge, which is one of the most beautiful resorts of its kind anywhere. It consists of luxurious central buildings surrounded by small individual cottages, all of which are built of native logs on a boulder foundation. Of all the thousands of visitors who admire the general effect there must be many a wealthy old lumberman whose expert eye marvels at these masterpieces of log construction. Certain it is that the lodge type of hotel accommodation has a strong appeal to the travelling public. Set in beautiful surroundings with which it is in perfect harmony, the lodge conveys a suggestion of the great wilderness which is restful to over-civilized people, especially when it is found in conjunction with perfect dancing floors, luxurious appointments, excellent service and porcelain bath-tubs.

In connection with the lodge there is a golf course which is becoming world-famous. Not only is it one of the most picturesque courses in the world, but every detail of its construction was advised on by technical experts with a view to making it worthy of world-championship games.

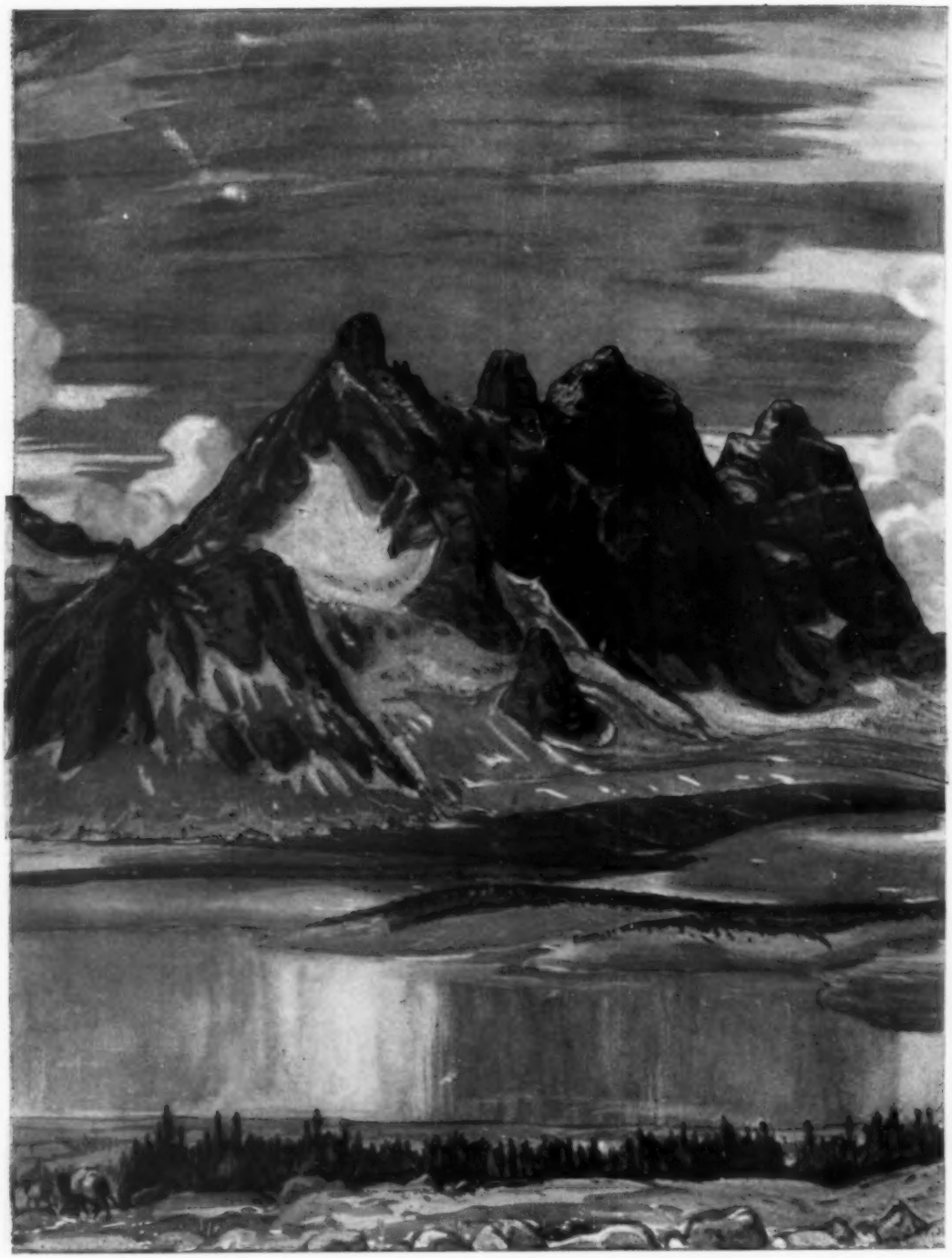
Besides the lodge, which is, of course, the Mecca of those who can afford it, there is good secondary accommodation for tourists in Jasper, to say nothing of the excellent public camping grounds for motorists. Indeed one of the charms of our mountain resorts is the great variety of people who find pleasure and health at them. There is the faultlessly-groomed old lady who never seems to be seen in the same dress twice and who gets her exercise being driven about by some heavy-handed guide whose natural vocation is hunting grizzly bears and who has to take elaborate precautions to disguise the fact that he is chewing tobacco. There is the lean Alpine climber whose edge-nailed boots leave tracks like a pterodactyl, and whose conversation is of no manner of interest to the keen golfer. Artists and trail riders, fishermen, photographers and motorists pass and repass through a host of young people who are only specialists in the art of extracting the greatest possible enjoyment out of life. Nor are the habitues less interesting than the tourists. There are a number of outfitters and guides at Jasper who have a justly-earned reputation as hunters of big game and trail finders; also horsemen who work in the Parks during the Summer and who find employment fence riding on the cattle ranges through the blizzards of Winter; and numbers of undergraduates who are working their way through the universities as truck drivers, golf caddies and waitresses.

Then there are the Jasper Park officials from genial Dick Knight, the Superintendent, to the quiet, rather set-looking men with wind-tanned faces who are game guardians and fire rangers from distant outposts of the park. These latter lead unnaturally solitary lives. Living alone in a "home" cabin from 25 to 50 miles away from headquarters, each ranger has a district for which he is responsible. From each home cabin there is a circuitous route of about 75 miles in length, with cabins at every 15 or 16 miles along it in which are kept food, blankets, fire-fighting appliances, and other equipment; a route which the rangers patrol, with horses in Summer and on snowshoes or skiis in Winter. In Summer the rangers stationed at points along the more popular routes of tourist travel



From a painting by A. Y. Jackson.

The Athabaska Valley.

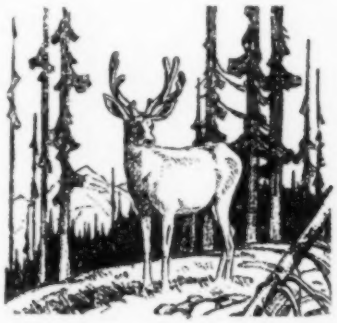


From a painting by A. Y. Jackson.

Amethyst Lake.

see many tourists and guides. In the late Autumn a number of hunting parties travel over the park trails on their way to points outside the park. But, in the Winter, when even the horses have been sent out for Winter feeding, there is no more lonely job on the face of the earth. One man was killed by a grizzly in the early Winter of 1929.

All game is rigidly preserved within the National Parks at all seasons. The principle of game conservation is one of the basic park policies of the Government and under the firm administration of the Commissioner of National Parks has always been consistently enforced. The following story is told of a well-known guide who was taking a sportsman and his wife on a hunting trip. On the evening of the day before they got into the hunting country outside the parks, some fine sheep made their appearance on the rocks just above camp and the sportsman tried to persuade the guide to let him have a shot at one particularly fine "head." Finally the guide closed the argument by saying: "Say, Mr. ——, if you really have to shoot anything tonight, you better shoot Mrs. ——, 'cause you are far more likely to get away with it than if you shoot that darned old sheep in the park."



The results of game conservation within the parks have been most encouraging. There is more game within the parks than ever before. Such magnificent animals as the elk, which had become almost extinct, are once again becoming numerous.

Wild animals react quickly to 100 per cent protection, and become so tame that nature-lovers may come across them in their natural surroundings at any time. Even from the hunter's point of view, there is a constant exodus of park-bred game into the country beyond, and it is a fact that hunting parties get as close to the parks as they can for that reason.

A first-class gravelled highway has just been finished from Edmonton to Jasper, from which there are well-kept scenic motor roads to Maligne Canyon and Mount Edith Cavell. The latter road is probably unique in that, after winding up the mountain side for many miles, it ends on the moraine of the great Edith Cavell glacier itself although the age-old ice beneath the road bed is covered with many feet of talus. What with the ice-cooled breath of the glacier and the fact that the precipitous face of the great mountain rises so abruptly that it almost seems to overhang the road, it is probable that many people never get quite so close to the Spirit of the Mountains as on their first visit to Mount Edith Cavell.

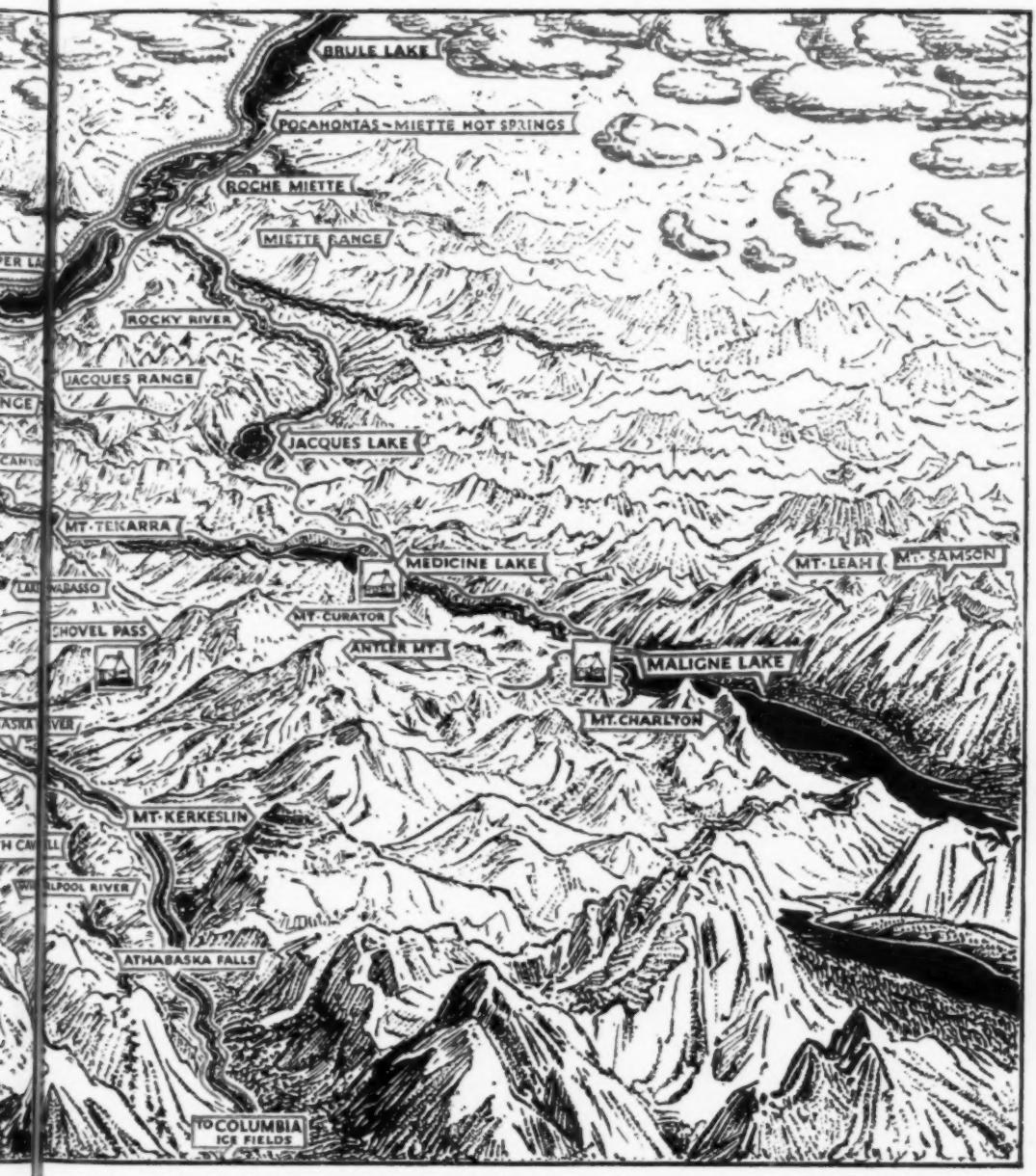
The question is often asked whether these high mountain automobile roads are safe. Many people find it difficult to believe that it is possible to construct safe roads through such a labyrinth of wild gorges. To those who have travelled them the answer is known, but to those who would like to, but may be deterred by motives of caution, it may be said that all mountain automobile roads in the parks are built by the Engineering Division of the National Parks Branch to a standard specification as to width, maximum grade, super-elevation of curves, and so on. Moreover, they are inspected every day and kept in perfect condition. For instance, there are no grades on the Mount Edith Cavell road which any ordinary standard-six car will not negotiate on high. Coming down, there is no necessity to use brakes at all, except perhaps to slow down at a few sharp bends, and nothing can be more delightful than to slide down the long grades in high. It may be said that the average fair-to-good driver is much safer on such a road than he would be in congested city traffic.

Some day—one hopes not too far distant—the Edmonton-Jasper Highway will be extended to complete at least two grand circuits, which will open up new vistas of wonderful beauty to those who can travel only by automobile. One will connect the present highway

In this map of Jasper National Park, railway routes are indicated by notched and double lines, motor road

with the Louise-Golden Highway by a 150-mile link passing along the foot of the highest ranges of the Rockies. The other will cross the summit of the Rockies and connect with the highway now being built around the Big Bend of Columbia River. The general route of the Jasper-Louise road is already one of the favourite trips for those who are fortunate enough to be able to travel by pack-train. There are several different routes, each one of which is full of interest. Perhaps the route which misses least of all the lovely views which it is desirable to see would be from Jasper to Maligne Lake by Shovel Pass.

There are many beautiful lakes in Jasper Park, but Maligne Lake is generally admitted to be the most beau-



...y plain double lines, trails by single lines, heated shelters by small houses and projected trails by dotted lines.

tiful of all. It has been painted by Canadian and other artists and photographed by many expert landscape photographers, but neither painting nor photograph can give any adequate idea of the depths of colour and shade which are characteristic of this gem of the mountains.

After leaving Maligne Lake the trail leads over Maligne Pass to Poboktan Creek, and thence to beautiful Brazeau Lake; thence up Brazeau River and over Nigel Pass to Camp Parker. From Camp Parker a one-day detour should be made to the summit of Wilcox Pass, from which one looks down on the corrugated ice surface of Athabaska Glacier, 1,300 feet below. As one raises one's eyes they follow an unbroken ice surface and become lost

in the immensities of the Columbia Ice Field, which finally merges with the far horizon more than 3,000 feet above the Pass. Out of the great Ice Field protrude the black escarpments of submerged mountains. At least seven mountains over 11,000 feet in height are visible from the grassy summit of Wilcox Pass.

From Parker Camp the route leads down the North Branch of Saskatchewan River where there is a ford across the main river just below the Forks. At this point the river bed is very wide, with several streams separated by gravel bars. With a good guide this Big Ford, as it is called, is safe enough except at periods of exceptionally high water. Arrived on the other side there are two possible routes. The one most usually taken is up the Mistaya, over Bow Pass, past Bow Lakes and down Bow River to Louise. The other follows up the South Fork and Howse River to historic Howse Pass and thence, by the Blaeberry and Amiskwi Rivers to Field.

Fortress Pass between Chaba River and Fortress Lake is about 56 miles by trail from Jasper. With the exception of Yellowhead Pass, through which the line of the Canadian National Railways runs, Fortress Pass is lower than any other pass across the main Divide, having an altitude of 4,405 feet above sea level as compared with 4,460 of the Crowsnest Pass and 5,320 of Kicking Horse Pass, through the latter of which the main line of the Canadian Pacific Railway runs

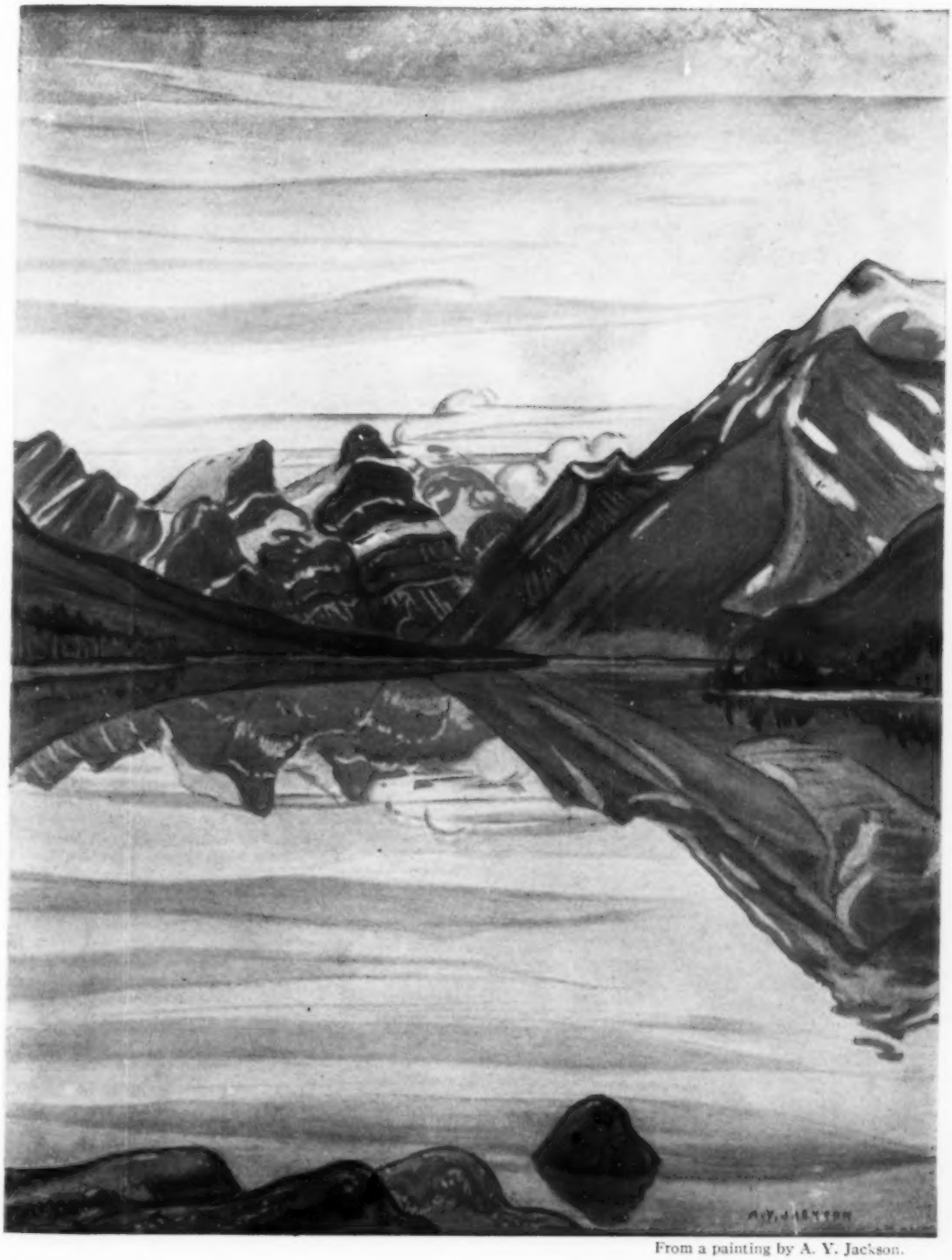
Fortress Mountain is a fine example of the massive type of mountain, with its tower-like, precipitous sides and its flat top, and the lake is a beautiful body of water hemmed in by steep mountain sides.

On the way to Fortress Lake the trail crosses the canyon immediately below Athabaska Falls, where the whole river plunges down into a fantastically-carved canyon. The first park ranger's cabin was built right at the falls, but the constant roar of the water was a little too much even for the nerves of a ranger and it has since been moved.

Nineteen miles below Athabaska Falls the trail crosses Sunwapta Falls, which consist of two falls in a deep, narrow canyon. The Sunwapta River is about 200 feet wide above the falls, and there is one point of the canyon where the visible opening is not more than three feet wide. The old trail crossed the Sunwapta by a ford, just above its confluence with Athabaska River, but in 1921, when I had to take my survey party up to Fortress Pass, the water was very high and the ford was a swimming proposition and running like a tailrace. with no reasonable expectation of abatement for a week or two. So we went on up to Sunwapta Canyon and built a bridge across it, good enough to get our horses over, and made a cut-off to intercept the old trail along the Athabaska, which has been used ever since.

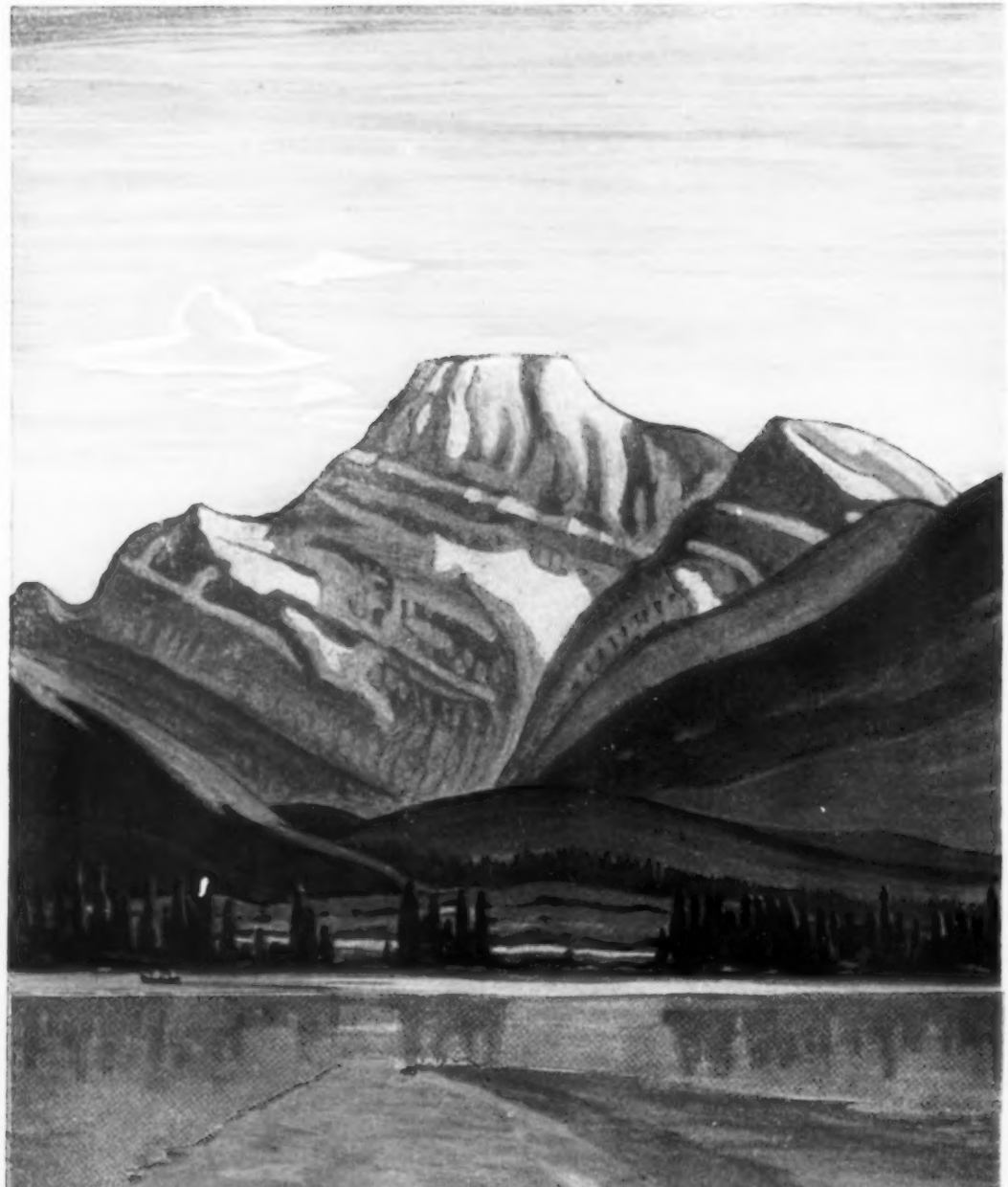
For the encouragement of those who contemplate travelling over the route, it may be said that the park authorities built a good bridge at the same place soon afterwards; as one of the park's officials tactfully remarked, "By Jove, that was a wonderful bridge you built, old chap, but it would never do to have anything happen to our tourists, you know!"

Athabaska Pass is one of the most beautiful passes in the Rockies, as well as being the most historically interesting. It is about 50 miles by trail from Jasper, along the Athabaska and Whirlpool Rivers. As the headwaters of the Whirlpool are approached there are some fine cascades and ice falls from the Hooker Icefield on the east side of the river. The summit of the pass consists of a pretty meadow with a string of small lakes of which the highest is the famous Committee's Punch Bowl, which is fed from the steep slopes of McGillivray Ridge. The



From a painting by A. Y. Jackson.

Maligne Lake.



From a painting by A. Y. Jackson.

Mount Edith Cavell.

Punch Bowl is a shallow little lake with a small outflow. The extraordinary thing about it is that the water from it flows both towards the Pacific and Arctic Oceans. It looks as if five minutes' work with a mattock would utterly destroy the nice balance of its outflow, but closer investigation shows it to be a rock-rimmed basin.

For a number of years after Thompson discovered Athabaska Pass, in 1811, this little-visited pass was the fur-traders' main route across the mountains in the maintenance of their overland communications between the Atlantic and Pacific coasts. In these days it is difficult to imagine keeping open a route which was over 4,000 miles through a wild country, without roads, and inhabited by savages who were not always friendly. Even today, with all the organized facilities for obtaining supplies or repairs which now exist, with no danger from Indians, and with the aids made available by telegraph lines and aeroplanes in case of disaster, a journey over the old fur-trade route would be a first-class adventure which could only be successfully undertaken by the hardiest and most experienced woodsmen. And yet the fur-traders made this long coast-to-coast trip every year in the ordinary course of their business.

There are curiously few traces left of the old trail over which half-breed voyageurs drove their laden pack-horses a hundred years ago; a few completely-grown-over blazes on standing stumps of trees which have been dead for half a century; a faint indentation of the surface in which the vegetation betrays that slight difference which always manifests itself in horse-trodden paths, and a few old cut logs, covered with lichen and which crumble away at the touch, are all that remain to show where the pioneers of the country have passed.

In 1921 a member of the Interprovincial Boundary Survey discovered a widely-scattered cache of 114 deeply-corroded musket balls within half a mile of Thompson's last camp on the Alberta side of the pass, and was subsequently much thrilled to find the following note in Thompson's diary, under date of January 13th, 1811, "Sent the men to collect and bring forward the goods left by the way; which they brought, except five pounds of Ball, which being in a leather bag was carried away by a wolverene." The cache from which the goods were brought on that day was the very camp near which the musket balls were found, and there can be little doubt that the "Ball" discovered in 1921 were the same which Thompson lost 110 years previously.

Tonquin Valley is another of the scenic wonders of Jasper Park, with its wide, grassy bottom, jewelled with Amethyst and Moat Lakes, and shut in towards the south-west by the stupendous range of The Ramparts with its jaggedly-serrated crest. From Mount Geikie (Alt. 10,854) to Bennington Peak (Alt. 10,726), the Ramparts, including the mountains within the cirque containing the headwaters of the mighty Fraser behind them, are steeper — that is to say they have a greater vertical height in proportion to their base area, than perhaps any other formation in the whole chain of the Rockies.

From Tonquin Hill, a small isolated mountain in the centre of this beautiful area which is only about 1,500 feet above the pass, the whole valley with its lakes, glaciers and the shadowed precipices of the Ramparts impending over all, presents an unforgettable panorama.

Tonquin Valley is one of the easiest places to reach from Jasper as well as being one of the most worth-while. Moreover, the trip can be made on a circuitous route so that every foot of the trail is of fresh interest. From Geikie, a station on the Canadian National Railways, the trail leads up Meadow Creek to Tonquin Valley, and

the return is made up Maccarib Creek, over Maccarib Pass and down Portal Creek to connect with the Edith Cavell Highway.

At the present time Tonquin Valley marks the southerly end of the Caribou Range, and some of these noble-looking animals can generally be seen in the meadows which surround Tonquin Hill. Formerly the Caribou Range extended much further south, and it is thought that cariboo are already beginning to work south again under the beneficent effects of parks game conservation.

Ten miles up Fiddle Creek Canyon from Pocahontas on the Edmonton-Jasper Highway, along a delightful hillside trail, there are the Miette Hot Springs which have valuable medicinal qualities. The present trail makes a short but interesting ride. However, the fame of these springs has grown so much that the National Parks administration is commencing the construction of an automobile road from Pocahontas to the springs this year.

In an article of this kind it is impossible to refer to more than a few of the wonderful scenic beauties of a park as large as Jasper. So far all the places described have been selected more or less at random to the exclusion of many others which might just as well have been chosen.

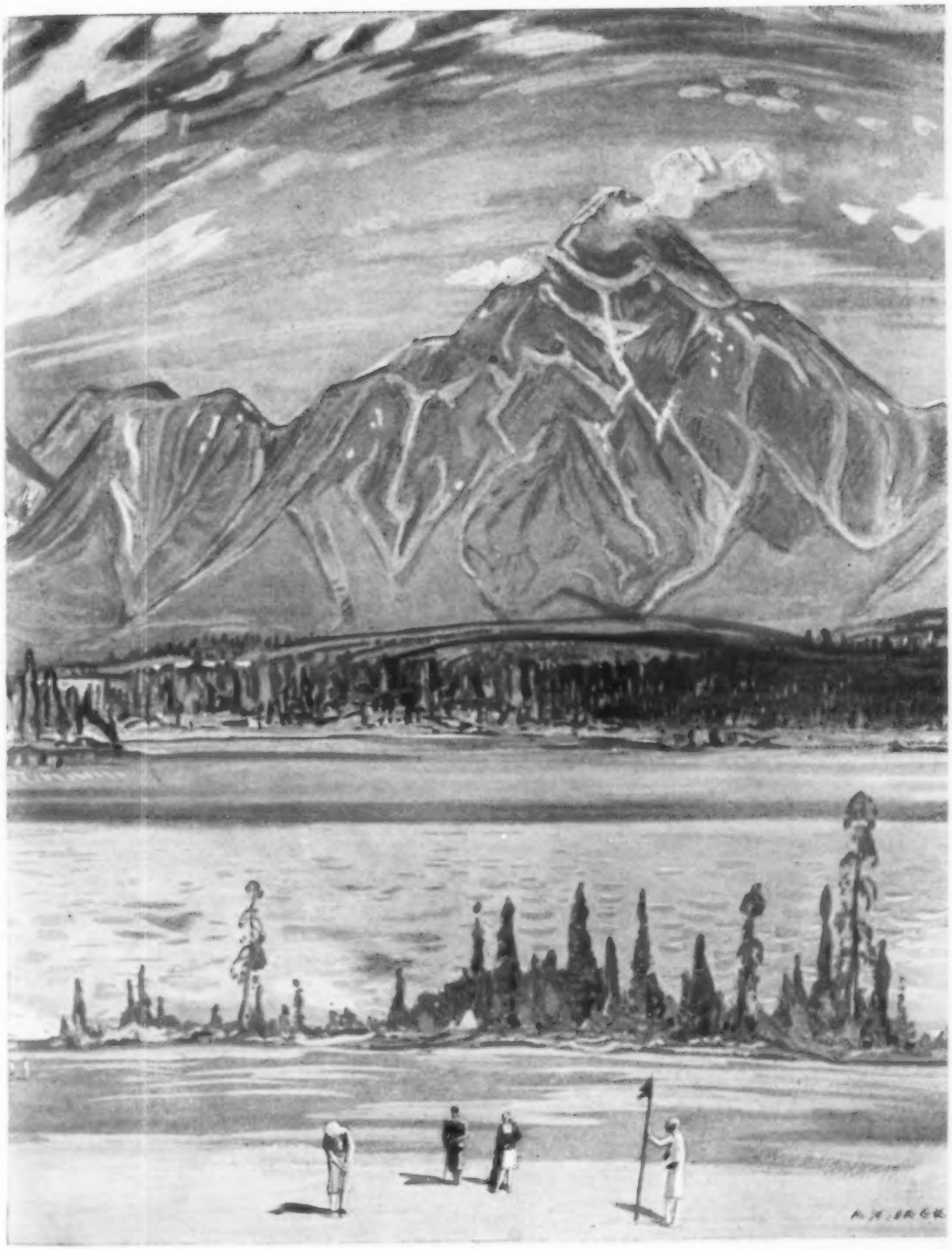
Roughly speaking, one-third of the entire park lies north of Athabaska River, but this northerly portion has not been so fully developed and consequently not so well known. There is, however, one long and beautiful trail up the Snake Indian River which leaves the Athabaska at Devona, 20 miles downstream from Jasper.

The name Snake Indian is all that is left of a small tribe of Snakes who were treacherously massacred by a party of Assiniboines at the mouth of Snake Indian River somewhere about 1811, when the North West Company established Jasper House. The legend runs —for history becomes legend quickly when it is handed down by word of mouth—that the Assiniboines invited the Snkaes to an unarmed peace conference, but carried their own weapons concealed and killed all their guests with the exception of one old woman.

The Snake Indian trail is much-travelled during the hunting season, as it is the most direct route out of the park to what is undoubtedly the finest big game country in the Rockies, namely, the vast stretch of high mountain territory lying to the north of Jasper Park and extending beyond Sheep Pass. Not only is this great hunting ground the natural habitat of every species of big game met with in the mountains, but it is to a large extent a natural game preserve owing to its remoteness from railways, settlements and mining villages, and the absence of roads through it. It takes time and money to get into it and the consequence is that practically all the hunting is done by organized parties in charge of a properly licensed guide who is responsible to the Provincial Game officers and who sees that the legal "bag" is not exceeded.

Unfortunately the Snake Indian Trail is not travelled by tourists as much as it ought to be, probably on account of its length. From Devona it is 114 miles to Robson station on the Canadian National Railways by a trail which is all beautiful and which reveals in turn so many different phases of mountain scenery. Mr. Lawrence J. Burpee, writer of historical and Nature subjects, has just published a book "Jungling in Jasper," describing this part of the park. For those who like the less well-beaten paths and are able to manage it, a three-weeks' ride up the Snake Indian to Snake Indian Pass, down Twin Tree Creek to the lake of the same name, over a six-mile mountain trail to Smoky River Canyon, and up the Smoky to Robson Pass, will add much to their knowledge of the mountains and to that wealth of memory which is the most lasting benefit of all travel.

The summit of Robson Pass is on the western boundary of Jasper Park, although Mount Robson itself is just



From a painting by A. Y. Jackson.

Pyramid Mountain.

outside it. There are more beautiful places in the mountains than the Mount Robson area, but there is nothing quite so big, no other place where each constituent feature of the landscape is drawn on such a stupendous scale. The following description is taken from the report of the Interprovincial Boundary Commission:—

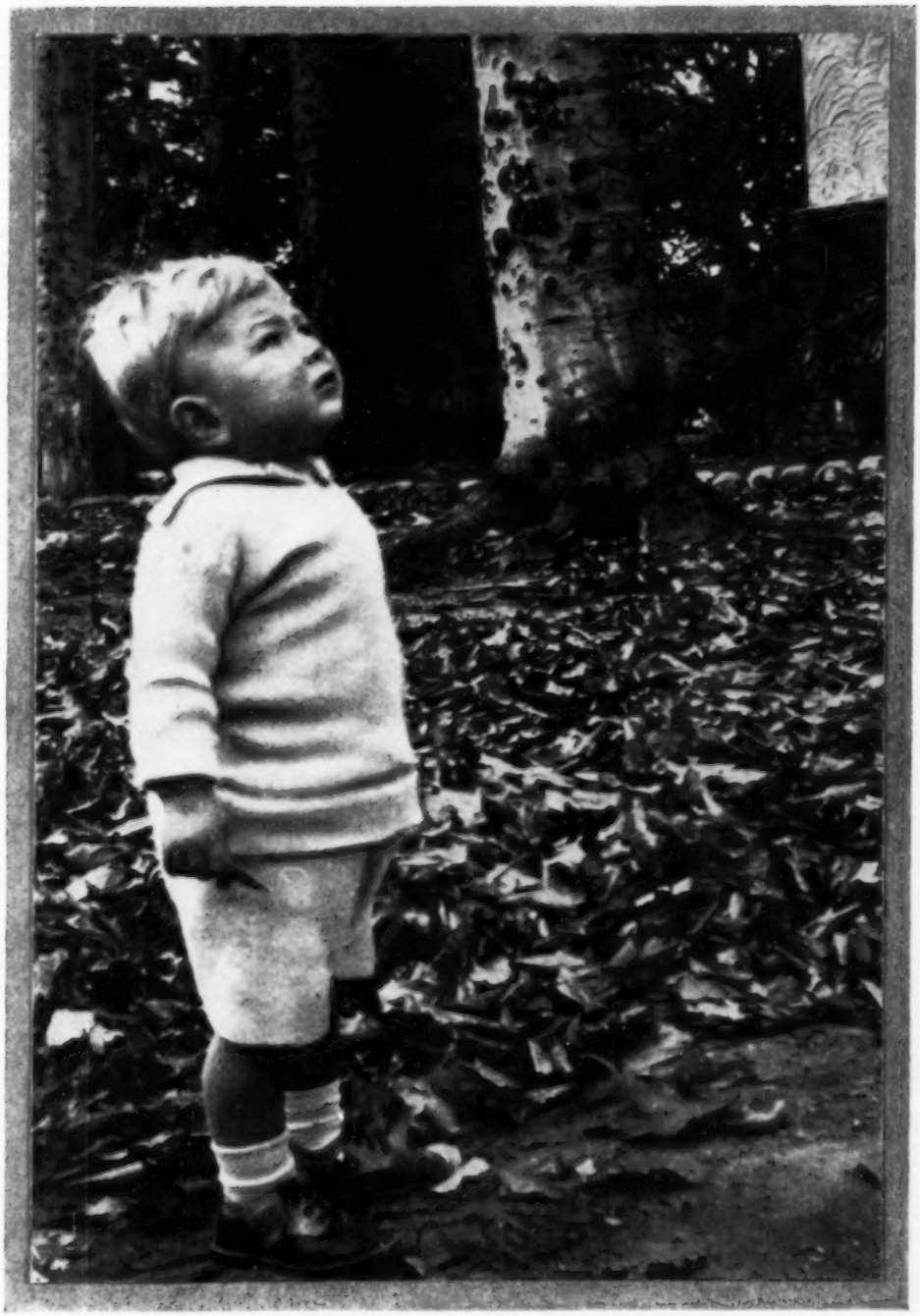
"In no other pass of the Rockies does one mountain so dominate the entire landscape as does Mount Robson. Its enormous mass (altitude 12,792 feet.) towers 7,532 feet above the summit of the pass at such close range as literally to overshadow it. Together with Robson Glacier, curling around its easterly face, Mount Robson completely fills the range of the eye's vision. It constitutes a picture of such unique character that it will probably become world-famous among artists as an outstanding example of a tremendous, solitary, self-contained subject in black and white, in the boldest style imaginable."

The return journey may be made through Moose Pass, Colonel Pass and lovely Miette Pass down the Miette River, but the trail is, or was, atrocious. On the other hand, the 18-mile trail from the summit of Robson Pass to Robson station on the Canadian National Railways is an excellent one, and is moreover a trail of the most colourful and absorbing interest. Skirting Berg Lake, it descends 1,200 feet by a switchback trail, part of which is built along a rock bluff on trestles, passing so close to magnificent Emperor Falls that the air is full of their misty breath; then through the valley of a Thousand Falls past Lake Kinney and across the Fraser River Canyon, it is the most picturesque trail of its length in all the mountain parks.

One of the outstanding charms of mountain scenery is its endless variety. It does not take much experience to make a mountain lover realize the futility of trying to draw comparisons between one mountain and another, or one pass and another. The great majority of all mountains are beautiful but they are so utterly different. Even the same mountain view varies from hour to hour with every passing change of sun and shadow.

It is natural to man to venerate with a certain amount of awe that which is known to be of great age. His spirit finds rest in the contemplation of anything which suggests continuity of existence. When one stands on a glacier a thousand feet thick, knowing that the ice beneath was formed in the prehistoric glacial period, which period was itself merely a passing phase of geological history, one realizes something of the immaterial character of Time. Like the stars in their courses and the changeless sea, the mountains bear witness to the infinite splendour of the Creative Mind of God.

(Quadri-colour plates and other engravings in this article are reproduced by courtesy of the Canadian National Railways.)



Eyes to the Skies, Young Canada!

A group of tourists at a resort hotel on the St. Lawrence River.

Five Million Tourists

By THEODORE MORGAN

FIVE million people are on the move each year, crossing the frontiers of Canada. This great migration for health, pleasure, sightseeing and recreation now constitutes Canada's second greatest industry and stands next in importance to the nation's wheat crop. It represents nearly $300,000,000 in money left in Canada yearly, and is one of the most lucrative "invisible" exports.

The rise in the value of Canada's tourist trade during the last 10 years has been little short of phenomenal. Between 1920 and 1929 inclusive, tourists from abroad are estimated to have spent in Canada a total of roundly $1,682,000,000. It is difficult to visualize just what this means, for the expenditure of such a vast sum of money is almost staggering.

THEODORE MORGAN

Born Montreal, 1887. Attended Montreal High School; graduated Hotchkiss Preparatory School, 1906. Entered business of Henry Morgan and Co., Limited; became a Director, 1911. President Retail Division, Associated Advertising Clubs of America, 1923-26. Alderman, city of Montreal, for two terms, 1926-30; Acting Mayor, 1926. Director, Royal Automobile Club of Canada, since 1915; its President, 1924-7. President, Montreal Tourist and Convention Bureau, since 1925; Director since 1922. Director Canadian Good Roads Association, since 1925.

Perhaps a better appreciation of this thing called tourist travel can be formed by the following comparison. According to the Federal Public Accounts, the total expenditure made by the Dominion Government under the heading "War and Demobilization" is placed at roundly $1,695,000,000. Thus it is seen that tourists spent in Canada during the past 10 years, a sum estimated at only a few thousand dollars short of Canada's immense outlays for war and demobilization purposes.

It is not to be wondered at, therefore, that the rise of this new industry to one of major rank, has been attracting the attention of the leading financial authorities of the country. There appears, as yet, no limits to the possibilities of growth in this direction. Canada's leading resort hotels are outstanding in the splendour of their setting, in the excellence and completeness of their service. Transportation by rail and water has witnessed vast strides in both the character and appointment of equipment till today, no finer may be had the world over.

Highway development has been equally impressive, and to this fact a large part of the tremendous increase in tourist travel is due. Of the 425,000

Many visitors come to Canada's numerous fishing grounds.

miles of highways in Canada, 155,753 are improved and form the main trunk and provincial through-highway systems. And this achievement has been wrought in a new country, sparsely settled, and is all the more impressive when it is realized that the population of the whole country is little more than that residing in the area of greater New York.

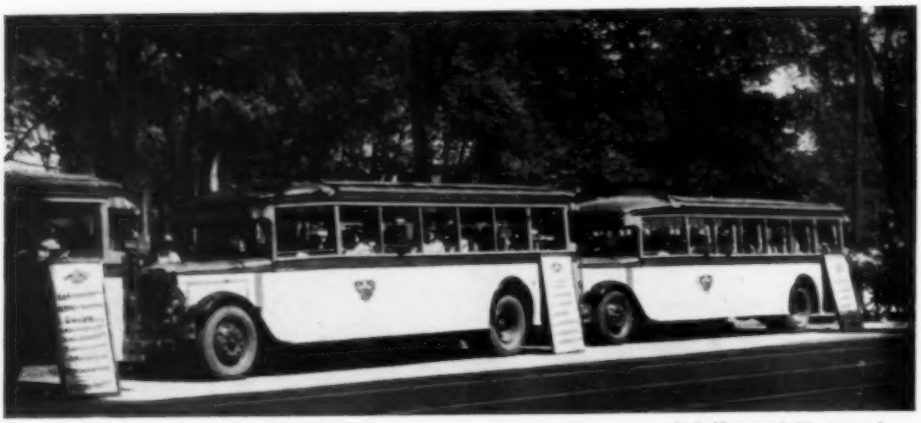
It is this spirit of achievement that has brought such outstanding accomplishment to a nation young in years and in the development of its marvellous resources. Few possibly realize the tremendous investment represented in our great resorts from the Rockies to the Maritimes, and that a thousand trails lead one to virgin forests and beautiful lakes suggesting all the pleasures of camping, while modern resort hotels, unexcelled anywhere, have made such names as Banff, Jasper Park, Muskoka, Murray Bay, St. Andrews-by-the-Sea and a host of other places as well known as the great commercial centres themselves.

Significant as has been the industrial development of Canada, as evidenced by the rise of Saint John, Montreal, Toronto, Winnipeg and Vancouver, greater still is the promise of that new industry, that vast invisible export called for want of a better name, "Tourist travel."

For years Canada has faced the problem of isolation. Water courses were open only in Summer. Roads were but mere lines reaching pitifully to nowhere, while rail alone linked east to west and made possible our national existence. Those were the days of hard pioneer struggles, when the prairies were blos-

Getting a thrill on a pleasure steamer "shooting" the Lachine Rapids, near Montreal.

soming into being, when industry was gaining a foothold, and when few besides the prospector saw the real beauties of that great hinterland of Canada.



S. J. Hayward, Photograph.

Loading city sightseeing autobusses.

This auto tripper carries as well as paddles his own canoe, through the Laurentian lakes district.

S. J. Hayward, Photograph

Tourists in the Canadian Rockies.

A constant stream of motoring visitors arriving at one of Canada's giant hotels. The old-style horse cab is occasionally seen in Canadian cities. There is one in the picture.

Bruce McClaren Co., Photograph.

Primitive transport in more remote parts of French Canada.

S. J. Hayward, Photograph.

Long-distance autobusses linking up Canadian and American cities.

Tourist hunters in the big-game country.

Two factors have wrought a great change. The advent of the automobile and the coming of good roads; and today the factor of the aeroplane is fraught with tremendous possibility. Already a vital and much-used means of transportation in our northland, the seaplane, promises to play an important part in the development of tourist travel of the future, for it will make accessible hundreds of beautiful lakes for fishing, camping, and other pleasures, now only disturbed by an occasional prospector or woodsman.

The coming of the automobile highway immediately changed the whole aspect of tourist travel in Canada. Roads dispelled that last great barrier —isolation. They brought a hundred million people days nearer a great new playground. They opened up virgin territory with a wealth of lakes and scenery far surpassing the fondest imagination. The early vanguard of tourists by car came into our midst before we were aware of the significance of the great migration that was to follow and destined to grow with such astonishing rapidity. The Dominion Bureau of Statistics estimates that in 1929 visitors to Canada spent about $289,000,000 and that about $208,744,000 came by

Dog-team travel in a French-Canadian village.

motor car. The increase in total cars during 1929 was about 20 per cent, and indications are that final computations will show an increase in 1930. When it is recalled that the volume of this traffic has increased more than threefold since 1920, it may well be conjectured just what the future holds.

In 1920 the total expenditure of tourists from other countries in Canada was $83,734,000. In 1924 it had grown to $248,876,000, and in 1929 to $299,188,000. These figures have been compiled by the Dominion Bureau of Statistics. The United States Chamber of Commerce estimates the expenditure for merchandise imported by these tourists as declared to the Customs authorities of approximately $5,000,000 in 1928. In the same year the American tourists in Canada are computed by the United States Chamber of Commerce to have spent a sum totalling $237,000,000 while the same body estimated that no less than 3,645,453 American cars crossed the Canadian frontier for tourist purposes.

It is also ascertained from the Dominion Bureau of Statistics that 4,508,809 cars came into Canada for tourist purposes in 1929, and that the favourable balance accruing to Canada increased by nearly $22,000,000 over the previous year.

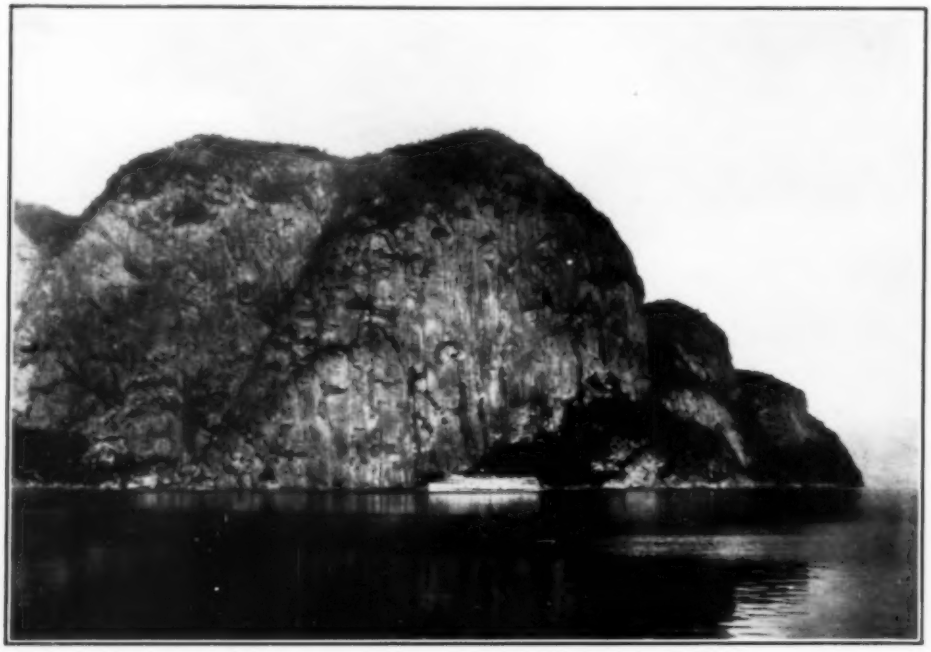
What does this all mean? It represents a steadily growing awakening to the possibilities for sightseeing, travelling, recreation, camping, fishing and hunting in a country, a large part of which is untrammelled by civilization, but that good roads and improved transportation facilities are making accessible.

The future is bright with promise. Already great resort hotels, the last word in luxury and comfort, have opened their friendly portals in the Rockies, on Ontario's glorious lakes, on the majestic St. Lawrence, and in the beautiful Maritimes.

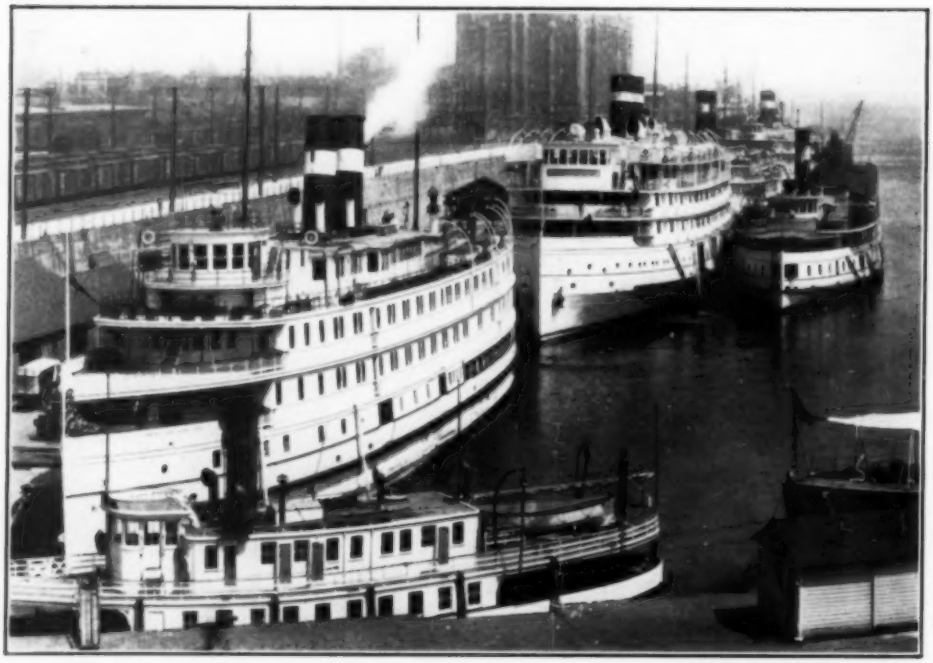
A host of smaller places are springing up. There is great need, however, and wide possibilities, in the development of charming homelike inns along highways, and beside lakes; places where a comfortable bed and a simple, yet wholesome, meal may be had. Much of the future of this growing tourist business will depend upon the appreciation of and fulfilling of just these needs. There is also a rapidly growing demand for suitable camping places along our highways, streams and lakes off main routes. This is a development which might well engage the attention of both the Federal and Provincial Governments. Standardization and supervision of camping sites is essential, both for the comfort of tourists and because of the ever-present fire hazard to our wealth of timberland.

S. J. Hayward, Photograph.
Motor callers in the Rockies.

The auto bus is becoming more and more a factor in making possible long-

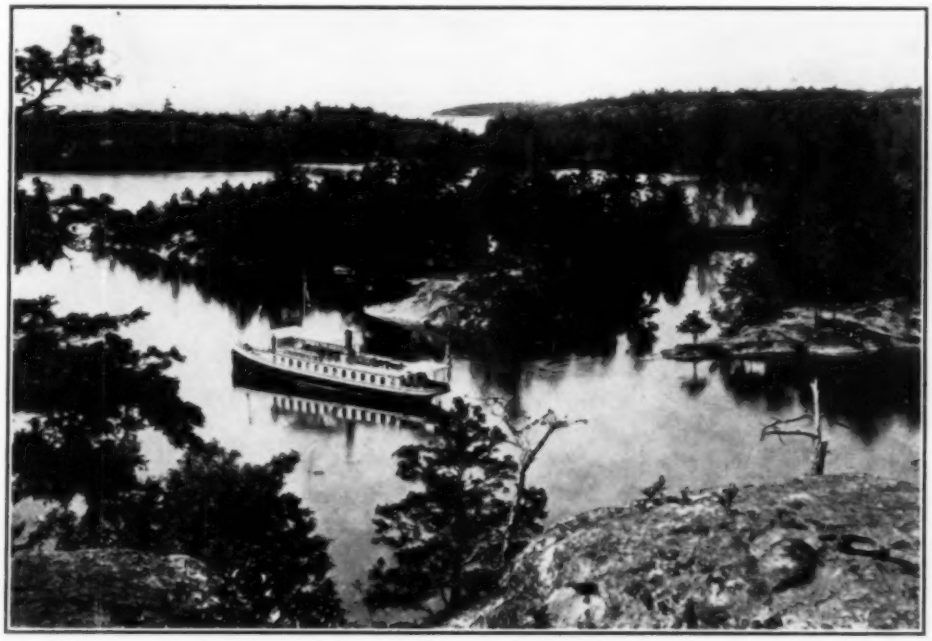


Lower St. Lawrence attracts crowds of travellers. The steamer, dwarfed by the great rock, is nevertheless one of the largest passenger vessels travelling the rivers.

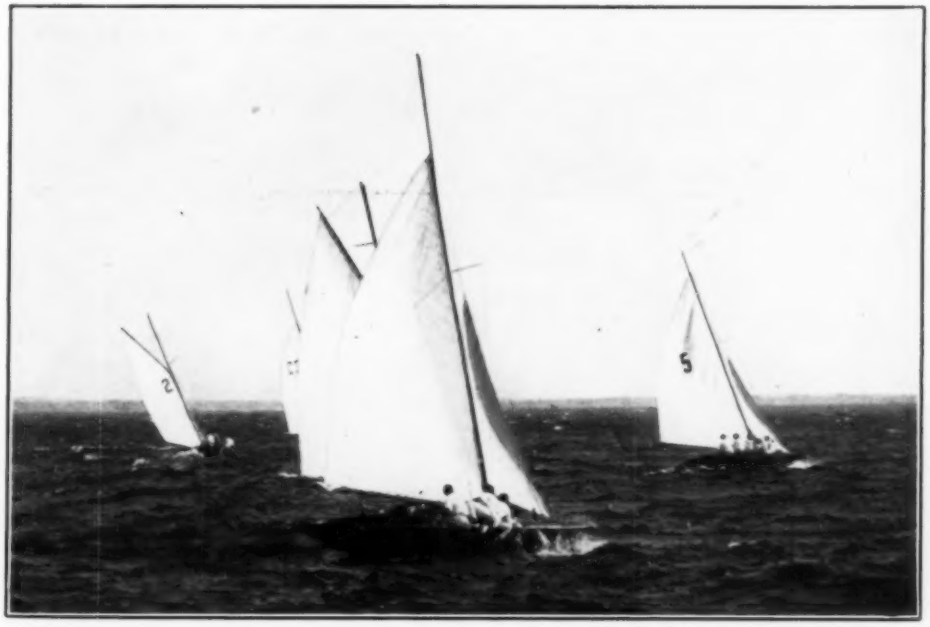


S. J. Hayward, Photograph.

These are river steamers of the type seen in the upper picture. This close-up gives a better idea of the size of these ships.



In the Georgian Bay district, a favourite retreat of travellers.



Yachting is one of the attractions for the holiday-maker. This scene is on Lake Ontario.

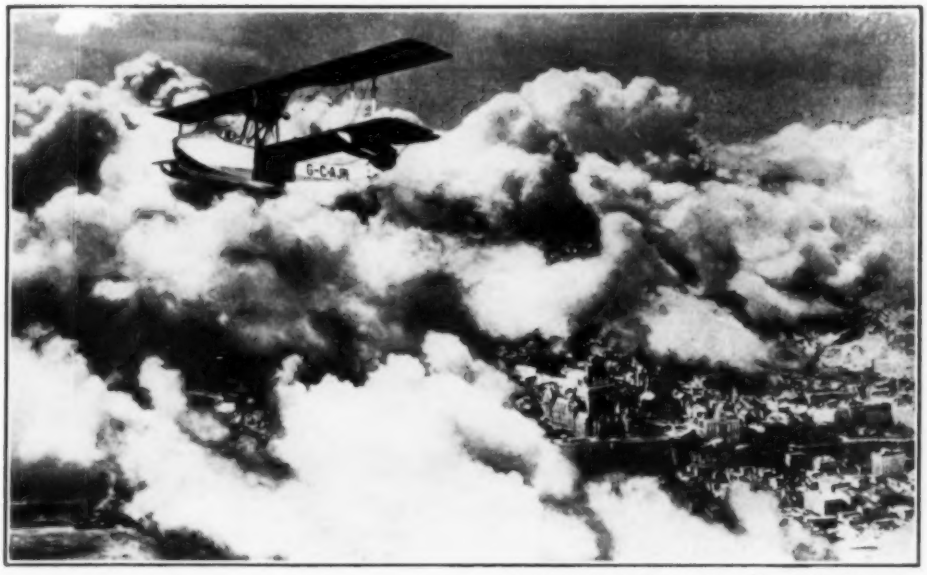
Some of the finest and fastest trains in the world whisk travellers over Canadian territory.

distance travelling to those who are not car owners, and to those who prefer a personally conducted tour, with all accommodation provided for at an established price.

The various Provinces have been fully alive to the need and the value of good roads, the development of which has played no small part in the economic progress of the country as a whole. While good roads have been lucrative as a means of increasing tourist travel, the vital part they have played upon the social and economic life of whole communities should not be lost sight of, for roads are a civilizing factor in a country as sparsely settled as Canada. There still remains the crowning achievement of a trans-continental highway to link east and west more closely to-

Compagnie Aerienne Franco-Canadienne, Photograph.

Seaplanes bring many remote lakes nearer to tourists.



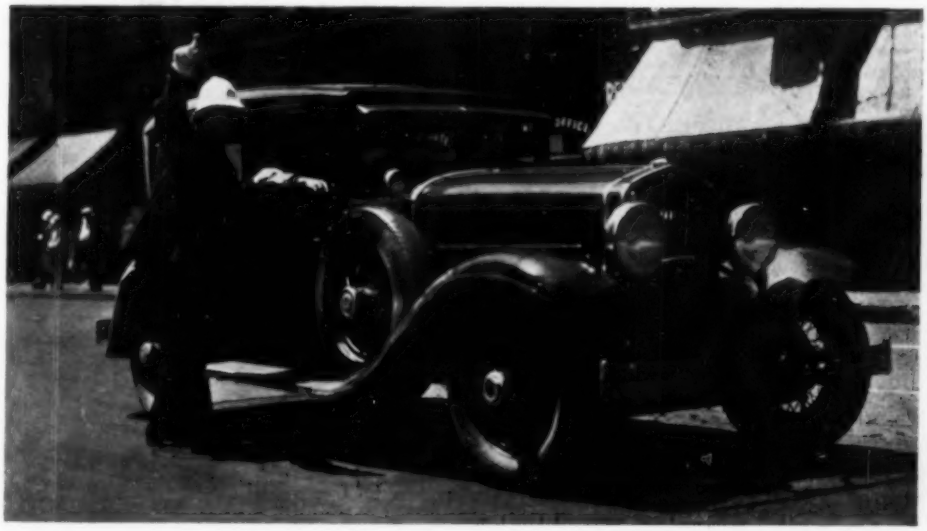
Compagnie Aerienne Franco-Canadienne, Photograph.

A trip over Canada's capital by air.

gether. It will assuredly come. Its need is already here. In its way it will be as great and vital an achievement as was the linking of the country by rail in 1885 when the first trans-continental line was opened.

If the trans-continental railways made possible and assured the national existence, then certainly a trans-Canada highway will intensify both social and economic life and make for that even greater era of development upon the threshold of which the present generation now stands.

Vast strides have also been made in both rail and water transportation. To-day one may traverse the continent from Montreal to Vancouver in 89



Canadian police forces are noted for their courtesy and helpfulness to tourists. Here is a policeman directing traffic and answering a visitor's question at the same time.

hours upon a train equipped in a manner unexcelled anywhere.

Nature has indeed smiled upon Canada. Her great rivers have become important commercial highways of the first magnitude. The waters of the St. Lawrence carry inland commerce more than a thousand miles to the sea, while innumerable rapids, rugged cliffs and ever-changing shore-lines make this river highway one of outstanding and commanding interest to the traveller. Palatial steamers have been placed in service and the tide of travel sweeps across the Great Lakes, through the Thousand Islands, down the St. Lawrence to the sea, and up the famous Saguenay. Slightly in excess of 2,000,000 people yearly travel the Great Lakes and the St. Lawrence route.

Tourists from the United States by rail and steamer showed an increase of 154,000 in 1929 over 1928, or about 10 per cent, according to the Dominion Bureau of Statistics, and it is estimated that this class of tourist traffic shows an increased expenditure of $7,238,000 over that of the previous year.

The great call is the out-of-doors, and as city life becomes more intense this call will tend to increase.

There are thousands of lakes still unknown to tourist or camper, and still awaiting the first fisherman. There are thousands of places far from the busy haunts of men, ideal for camping purposes. Colonist roads are constantly being broadened into main highways and each year a wealth of new territory becomes available to the tourist. There is an increasing appreciation and coordinization of train, motor, bus and plane service, bringing new lakes, new haunts, new beauty spots within reach of the city dweller. This is what Canada is offering. Her steamships ply the seven seas. Her transportation companies circle the globe. Swift trans-Atlantic and trans-Pacific liners dock each week at her ports, vital links in the world's transportation service.

On a Canadian highway.

This is the background which but suggests what the future holds. To the south resides a population of over 120,000,000 people who are known as the greatest travellers in the world. The roads that pass their 20,000,000 front doors, all lead to Canada, and of the 32,000,000 motor cars in the world, 77 per cent are located in the United States. More than 50 per cent

One of the many Canadian camping grounds for motorists.

Canoeing is one of the popular sports of visitors.

Travel by steamship through the famous Thousand Islands.

S. J. Hayward, Photograph.

Many tourists now come to Canada for Winter sports. They have learnt that Canadian trains run on time every day in the year, and that the taxi service operates in Winter as well as Summer.

of this vast car-owning population is within easy motoring distance of Canada.

Thinly-settled as Canada is, with a population of only 10,000,000 in a country territorially larger than the United States, there has yet been developed a net-work of improved through-provincial highways reaching a grand total of 155,753 miles. In the Canadian Pacific Railway Company we have the greatest transportation system in the world, and in the Canadian National Railways the largest railway mileage under one management on the continent. Montreal, a thousand miles inland from the sea, is vieing with New York in trans-Atlantic passenger service, and each year witnesses an increasing number of American travellers sailing from Canadian ports.

Hydroplanes roar into new and distant points, landing on lakes where man has never been before. New road con-

Bruce McLaren Company Photograph.

A party of tourists setting out for a sleigh-ride.

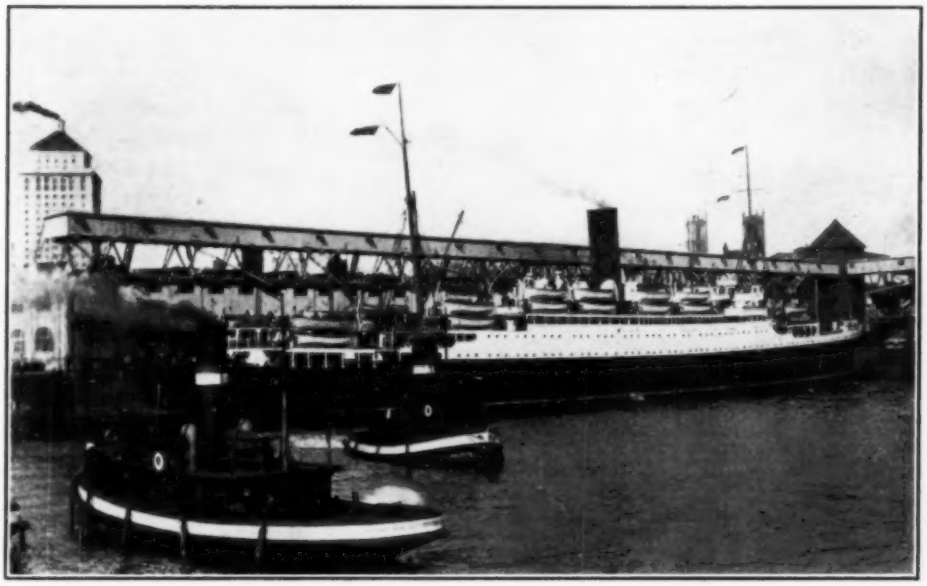
struction is constantly opening a wealth of scenery unequalled on this continent. The tourist presses hard upon the heels of construction gangs, anxious to glimpse for the first time the beauties of a new country. The building of the highway in 1928 around the Gaspe Peninsula in Quebec, to use this as an illustration, immediately made accessible to the motorist one of the most rugged and beautiful areas in the whole of Canada. Sleepy little villages,previously accessible only from the sea, and experiencing an isolation that in terms of transporation placed them a thousand miles from civilization, gazed in astonishment at the thousands of motor cars passing through their countryside with the completion of this highway.

Vacation time is not in Summer alone in Canada—Spring on her lakes, Fall in her woods, Winter on skiis. Each season holds its charm. More and more are the outdoor sports of Winter-time finding favour with travellers. That the crisp, bracing air of our northern climate brings health and vigour is attested to by the youth of our land who look forward to Winter with as much zest as many do to Summer.

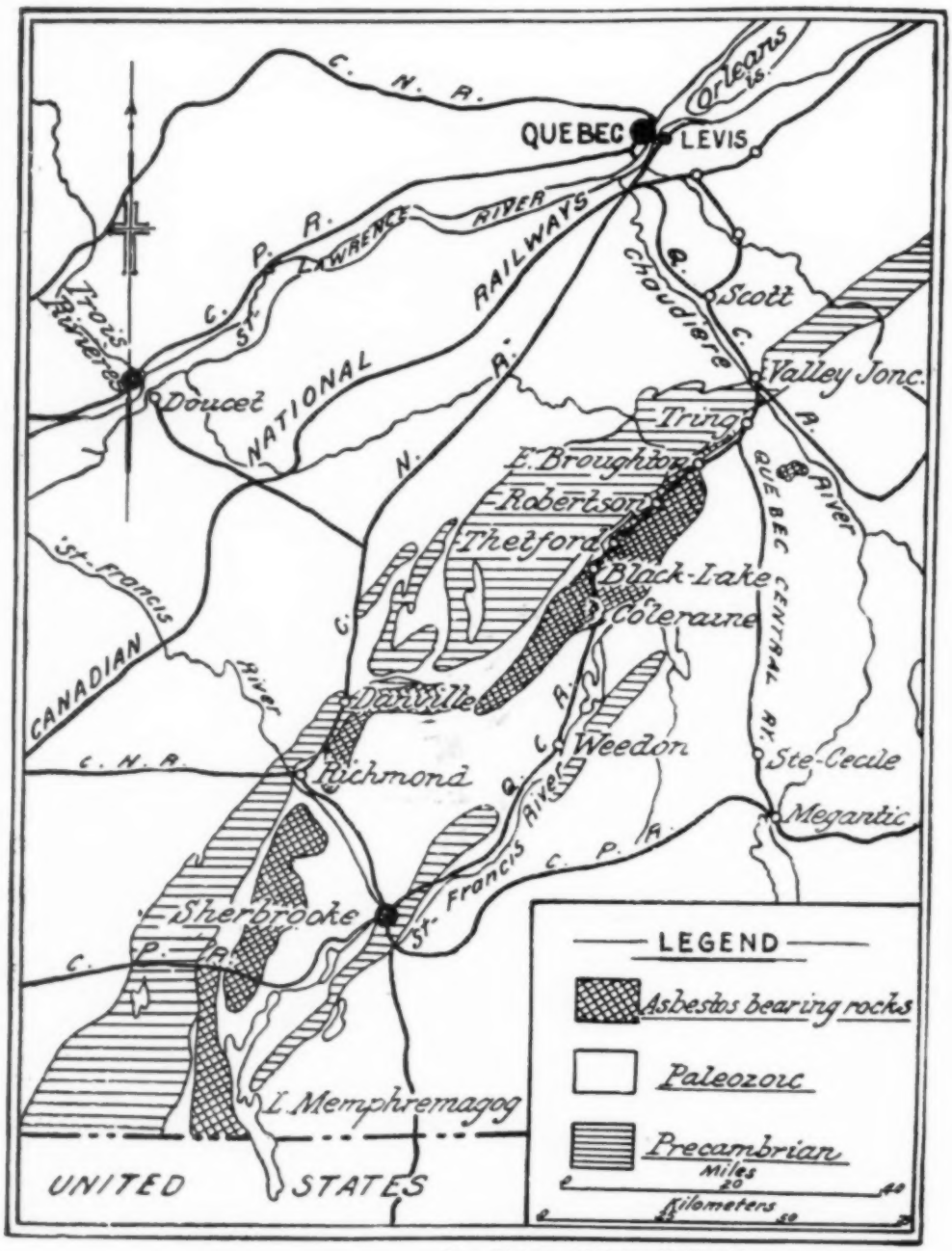
Many resort places are devoting considerable attention to the development of Winter sports, ski-ing, tobogganing, bob-sleighing, snow-shoeing, hockey and skating. Out of Montreal alone, each week-end, during the Winter months, depart ten trains, laden with skiers for the Laurentians and more and more are travellers from other lands coming to Canada to enjoy her Winter in her mantle of white.

A mighty empire in the making is Canada. Rich as she is in natural resources, timber, minerals and water powers, she also possesses in her scenic beauty an inexhaustable fount of wealth that is destined in the years to come to play an ever-increasing role in her economic development.

Tourist travel, as yet, is in its infancy, despite its amazing figures. The next decade will probably witness an increase as notable as the last. Canadian American tourist travel is greater than that between any other two countries in the world. Important as is the economic aspect of this development, it yet bears a far greater portent in its friendly ambassadorship.



The trans-Atlantic steamships carry their loads of passengers to and from Canadian ports.



From "Asbestos Mining and Milling" by Capt. J. G. Ross.

Sketch map of the "Serpentine Belt," Quebec, in which occur the deposits of asbestos.

Asbestos—"Pierre à Coton"

By B. MARCUSE

AMONGST the early French settlers in the Province of Quebec, asbestos was called "Pierre à Coton" (The Cotton Stone). This name was used because the stone appeared to them as a stone of cotton, and in some respects they were right.

The appearance and quality of asbestos justify in many ways the nickname given to it by the inhabitants because whilst it looks like stone, it can be woven like cotton and wool, and in its natural state it even looks like spun glass. It is smooth and silky to the touch, and possesses at the same time great tensile strength.

Occupying the position of a connecting link between the animal, vegetable and mineral kingdoms, it possesses some of the characteristics of all three. Whilst in appearance as light, buoyant and feathery as thistledown, it is, in its crude state, as dense and heavy as the solid rock in which it is found. Seemingly as perishable as glass, it is yet older than any order of animal or vegetable life on earth. So little, indeed, is it affected by the dissolving influences of time that the action of innumerable centuries, by which the hardest rocks known to geologists are worn away, has had no perceptible effect on the asbestos found embedded in them. Whilst the greater portion of its bulk is composed of the roughest and most gritty materials known, it is really as smooth to the touch as soap or oil. Apparently as combustible as tow, the fiercest heat cannot consume it, and no combination of acids will affect the appearance and strength of its fibre, even after days of exposure to their actions.

It is not affected by heat, cold or dampness. It possesses two properties which are not found combined in any other substance. It is textile and it is incombustible. It is a perfect non-conductor of electricity. Hundreds of millions of dollars have been invested throughout the world in the mining and manufacturing of it. Over $10,000,000 in value of the raw material alone is exported from the Province of Quebec every year, and when it is remembered that less than a century ago asbestos was practically unknown, it is not unreasonable to assume that within the next hundred years the asbestos industry will make still greater strides and become one of the most important industries.

The name asbestos is derived from the Greek, and signifies unquenchable or unconsumable. The early Romans obtained their supplies of asbestos from the Italian Alps and from the Ural mountains in Russia.

When asbestos was first discovered it was considered to be of vegetable origin, probably because of its silky appearance and unctuous feel. Specimens of woven asbestos made in the days of the Romans are on exhibit at the Vatican, and these specimens contain a certain percentage of vegetable fibre intermixed with the raw asbestos. The same practice is still carried on nowadays by adding cotton, although the finer grades of asbestos, known as chemically pure

B. MARCUSE

was born in Montreal in 1882, son of Berthold Marcuse, one of the pioneers in the asbestos industry, and has himself been intimately connected with the industry since 1900, at which time he joined the Canadian Asbestos Company. In 1907 he became associated with the Amalgamated Asbestos Corporation, predecessor to the Asbestos Corporation of Canada, now Asbestos Corporation Limited, as general sales manager, and during the next 20 years held various other important posts within the industry. In 1927 he purchased the Canadian Asbestos Company, of which he is now President and General Manager. He was educated in the public schools of Montreal and at Bishop's College School, Lennoxville, has travelled extensively, and is probably one of the best-known figures in the asbestos business.

Acknowledgement is made to the officials of the Asbestos Corporation, Canadian Johns-Manville Company, Johnson's Company, Bell's Asbestos Mines, Nicolet Asbestos Company and Quebec Asbestos Corporation, for co-operation with the author, the Managing Editor of the Journal and the Journal photographer, in the securing of the textual and photographic material of this article during a special tour of the asbestos region.

Royal Canadian Air Force photographs.

Above is an aerial view of the town of Thetford Mines and vicinity, showing several mines and the huge dumps of refuse.

Below is an aerial view of the Canadian Johns-Manville mine at Asbestos, with the mine to the right and the refuse dump, the immense grey object in the foreground. This refuse dump containing the useless part of the Asbestos rock, constitutes a problem in itself, involving as it does heavy expenditures in haulage and territory.

grades, are made of the pure crude asbestos showing that it is not necessary to add anything to the mineral.

When Marco Polo was travelling through Siberia in the 13th century he was shown some cloth which resisted the action of fire, and he found that it was made of a fibrous material called "Amianthus". This material probably came from the Island of Cyprus. The word "Amianthus" is really a translation for asbestos.

The early history of asbestos states that Charlemagne used table cloths made of asbestos, and to amuse his guests threw them into the open fireplace and afterwards took them out, thereby mystifying his company through the fact that they had not been destroyed.

From this early history it is apparent that this peculiar non-combustible and spinnable material was recognized as having some value, and whereas early attempts to use asbestos commercially were made from time to time, it was not until the middle of the 19th century that asbestos came into its own. Since then the exploitation and development of mechanical methods for the preparing of this product of inorganic nature have gone ahead apace.

Various kinds of asbestos are found. Each country in which it is found produces a different variety. However, the two most important classes are known as chrysotile and amphibole, the first-mentioned having considerable tensile strength and therefore adapted for textile purposes, whereas most grades of amphibole cannot be spun. As stated, asbestos is never precisely alike in any two places. This is best illustrated by the collection on exhibit in the author's office, consisting of more than 500 different specimens. Then again, the colour varies—it is found in all shades and hues, in all lengths, and changes from the early "Mountain Leather" and "Crystals" to the finer silky threads which can be spun into yarns which weigh less than an ounce per 750 feet, and possess great tensile strength.

Specimens about half actual size of crude asbestos of the finest grade. The fibres are easily discernible.

Many people wonder just how the fibres are separated so that the various lengths are brought together. A technical book would be required to go into

A panoramic view of the vast amphitheatre of the Canadian Johns-Manville mine at Asbestos, which covers an area of 50 acres. It is a shallow mine, and constantly extends as the terraces are cut further back into the rock. Portable railway tracks are laid along the terraces, and dump trains move the broken rock from terrace to mill. When a new terrace is blasted the tracks are moved into the "face". A machine called a "track mover" is gripped to a length of track and in a few minutes it moves the track to the new position, lifting it about two feet at a time, ties and all. In the dim distance, near the centre, is seen a church steeple, a land-mark of the village of Asbestos, which is on the edge of the mine and is gradually being pushed

further away by the growth of the mine in its direction. Below is the Asbestos Corporation pit at Thetford Mines. It is a deep mine, being 450 feet from the surface, with the sides rising steeply. The method of moving rock from the working "face" here is by "scoops" which are first hoisted vertically to cable-ways, and then drawn horizontally along the cables to the cable stations, from which dump trucks take it to the mills. This is the greatest cable-way system in the world having a length of 1,400 feet between derricks, and being capable of lifting over 7,000 tons of rock every working day. The Bell pit is seen in the distance.

A close view of a section of the serpentine asbestos rock showing the asbestos veins in their natural state at the Bell mine.

these details, but in a few words it might be stated that the entire process is a mechanical one and that the main operation takes place in machines known as collectors and graders. Asbestos is sold by the ton, and the price is based on the length of the fibre; therefore, a machine had to be devised whereby the producer could test his fibres and whereby the buyer would know he was getting the correct grade or quality, consequently, a shaking machine was invented. This machine consists of four boxes on top of one another—each box has a different screen with a different mesh and gauge. One pound of the asbestos fibre is placed in the top box and the machine is allowed to run for two minutes at 300 revolutions per minute. The machine being built with a ¾ eccentric gives it a shaking motion. After the machine has run for two minutes, it is opened and the residue on each screen at the bottom of each box is weighed. The more fibre found in the top or first box where the screen is widest, the better and more valuable the grade, and this process is continued until such grades as only show a residue in the bottom and second box are obtained and sold as the lower grades.

The combination of figures obtained on each box added together will always gives the sum of 16 ounces, so that what is commonly known as spinning fibre might test 4 ounces on the first box, 7 ounces on the second box, 4 ounces on the third box and 1 ounce on the bottom, whereas a short fibre tests nothing on the first and second box, 5 ounces on the third, and 11 ounces on the bottom box. Other combinations always total 16 ounces.

Asbestos is widely distributed and found in many countries, but as already stated, every country produces a diff-

erent type or kind. Some of the most important countries, outside of Canada, in which asbestos is found, are Rhodesia and Cape Colony in South Africa, in Russia, Vermont and Arizona in the United States, the Island of Cyprus, Corsica, Australia, the Italian Alps, Finland and South America. However, asbestos is not found in commercial quantities except in few places.

To-day the finer grades of asbestos are used for making asbestos textiles. These textiles are again turned into various articles of commerce. Probably the largest use for asbestos is for making yarns for brake-band lining. Every car is equipped with asbestos brake lining. The best brake lining for automobiles is made of the long grades of Canadian fibres and crudes. One cannot visit a theatre without seeing an asbestos theatre curtain. Asbestos is used for filtering acids, insulation, such as boiler and pipe covering, fire-proofing, packings, millboard and asbestos paper. Asbestos roofing manufacturers and the paint trades use it to a large extent as a base. Artificial floors are sometimes made of it.

Some other uses of asbestos are for:—acoustical plaster; brake-bands for wheels and discs; boards; boiler coverings; boots; brushes for corrosive liquids; fireproof clothing; cork and asbestos mixtures; covering for radiators; corrugated paper and sheets; door-sills and frames; electrical insulation switchboard and boxes, handles, cords, cables, covering for wires, vulcanized materials; felt and wool covering; filters; fire extinguishing mixtures; flat-irons (handles and stands); heating plates; floors; insulation in film industries; insulating material for boilers and steam pipes; insulation of refrigerators; lining for

In this mine at Nicolet all the rock is drawn from the face of the pit on a track operated by a cable.

This illustrates drillers at work on perpendicular holes. In the foreground are seen plugs in the holes ready to be charged for blasting as soon as the whole series is completed, they are set off simultaneously.

These drillers are preparing the holes for charges of dynamite, in this case they are being drilled horizontally.

The explosion showing the upheaval of asbestos-bearing rock caught by the camera at the moment of the blast.

After the blast has taken place. The rock is now in condition to be lifted by powerful shovels and transferred to dump cars, which in turn transfer it to the mills. Note the size of some of the pieces which will go into the crushing machines later.

An electric power shovel loading a train of cars with serpentine rock after blasting in the Canadian Johns-Manville mine.

Men at work in the open mine "cobbing" and separating the finest grades of asbestos from the rock after blasting and prior to shipment to the mill. All manner of mechanical contrivances are used in the asbestos industry, yet it has been found profitable to have hand labour search for the higher and larger veins of crude asbestos and to separate them from the less valuable grades which are passed through the mills.

furnaces (in factories and homes drying rooms, baking ovens); magnesia pipe insulation; mattresses; packing material (counteracting chemical agents, dry and wet heat, high pressure steam, for pumps, air brakes, etc.); painting materials and colours; paper; paste and cement for building material; plaster for walls and ceilings; road-building material; roofing materials (slate and tiles); sound-proofing material; textiles (clothing, draperies, covers, rugs, tablecloths, etc., tarpaulins, theatrical decorations, mats, belts); wall hangings; wall paper; water-proofing with impregnated asbestos; wicks and torches; artificial wood.

The first discovery in Canada was in the early sixties of the last century when a deposit of silky-fibred stone, so-called, was found in the Province of Quebec. A sample of this was sent to London for exhibition purposes, and later on other vast deposits were discovered from which Thetford, Black Lake and Asbestos, near Danville, developed. These now constitute the world's greatest reserves of Chrysotile asbestos. Mining operations were started in the Province of Quebec around 1878, but at that time only the better grades of crude were used. Today, however, all grades are used, and the biggest bulk of the production in the Province of Quebec is what is known as fibres of the grades used for shingle and paper-making, besides which, of

course, the better grades for spinning and the lower grades for insulation are also found.

On a map of the Province of Quebec you will see the names of Danville, Asbestos, Black Lake, Thetford Mines and East Broughton. At and close by these places are all the asbestos mines of the region. The busy little towns in and around which there are a number of mines, are peculiarly asbestos mining towns. They owe practically their whole existence and their population to the presence of the mines.

The asbestos region of Quebec may be really divided into three areas—the Danville district, where the Canadian Johns-Manville Corporation has opened up a vast deposit; the Thetford and Black Lake district, where companies such as the Asbestos Corporation, Bell Asbestos Mines and the Johnson Company are situated; and the East Broughton district, where the Quebec Asbestos Corporation is the chief operator. Queer to relate, each district produces a different class of asbestos. Danville is known as a milling district, and less crude asbestos is found there than at Thetford. Thetford is recognized as being the district from which the finest crudes and spinning fibres in the world are obtained, and at Broughton the better class of the shorter grades are produced. Black Lake is known for its shingle stock.

The properties of the Canadian Johns-Manville Corporation are situated at the village of Asbestos, five miles from Danville. Crude asbestos was first removed from the present mine of the Company in 1887. It was originally called the "Jeffery Asbestos Mine" as it was located by W. H. Jeffery. Upon the death of Mr. Jeffery in 1894, the property was bequeathed to William Farwell and Frank C. Thompson, who sold it in 1895 to Messrs. Boas, Greenshields and Marcuse (the last-named being father of the

At the Quebec Asbestos Corporation mine at East Broughton the dump cars, handled by an electric locomotive, bring the broken rock from the various "faces" to a covered cable-way system which draws the cars to the surface and dumps their contents into the crushers. On the top of the pit at the left will be seen an electric shovel which is digging the top soil from the rock prior to the coming of the drillers to dynamite the rock underneath.

author). These men organized the Danville Asbestos and Slate Company, which was bought out in 1897 by the Asbestos and Asbestic Co., Ltd. The latter company went into liquidation in 1916, and the property was purchased by the Manville Asbestos Company, Limited.

In 1918, the Manville Company transferred all properties to the Canadian Johns-Manville Co., Ltd. This property has since been greatly developed and now forms the largest single source of supply for commercial asbestos in the world. What was formerly a comparatively small hole in the ground is to-day a vast pit, 50 acres in area. One sees a tremendous hole in the ground—but what a hole! In it is being waged a mighty and continuous battle with Nature to wrest the fibre-bearing rock from her stubborn grip. Here we have great electric shovels, older craft in the form of huge steam-shovels, while gasoline-powered shovels are used for lighter duty.

Auxiliary equipment includes electric locomotives, steam locomotives, dump cars, service cars, box cars, telephones, signals, power lines, air lines, water lines and batteries of search-lights. At night, the bowl of the pit is illuminated by powerful electric lights and the loading out of materials proceeds as in the daytime—dirt and waste rock to the dumps, ore to the mills. At times it is a battle with the elements also. Rain or Shine, Summer or Winter, the work continues. Storms and heavy snows require the concentration of all forces at threatened points. Lines of communication must

A near view of the King pit of the Asbestos Corporation Ltd. at Thetford Mines showing terrace workings, a scoop in operation on a cable-way, and giving an idea of the depth of this immense hole. The tiny black figures, almost indiscernible, near to about centre-right of the photograph are mine workers.

The "face" of the asbestos-bearing rock in the mine of the Quebec Asbestos Corporation at East Broughton.

be kept open. Transportation must be kept moving. For this is an open-pit operation, with all that it implies.

Ahead of actual operations, go the prospect drillers, sinking their diamond or shot drills deep into the ground to obtain information. Maps are made and a plan of campaign drawn up. Power shovels clean the dirt, or over-burden, from the rock surface. The rock drillers sink their holes into the rock and the holes are then loaded with explosives and blasted. Then come the big power shovels, tracks are run in, and the cars loaded, shunted around by small locomotives, and later picked up in trains by hauling locomotives and taken out.

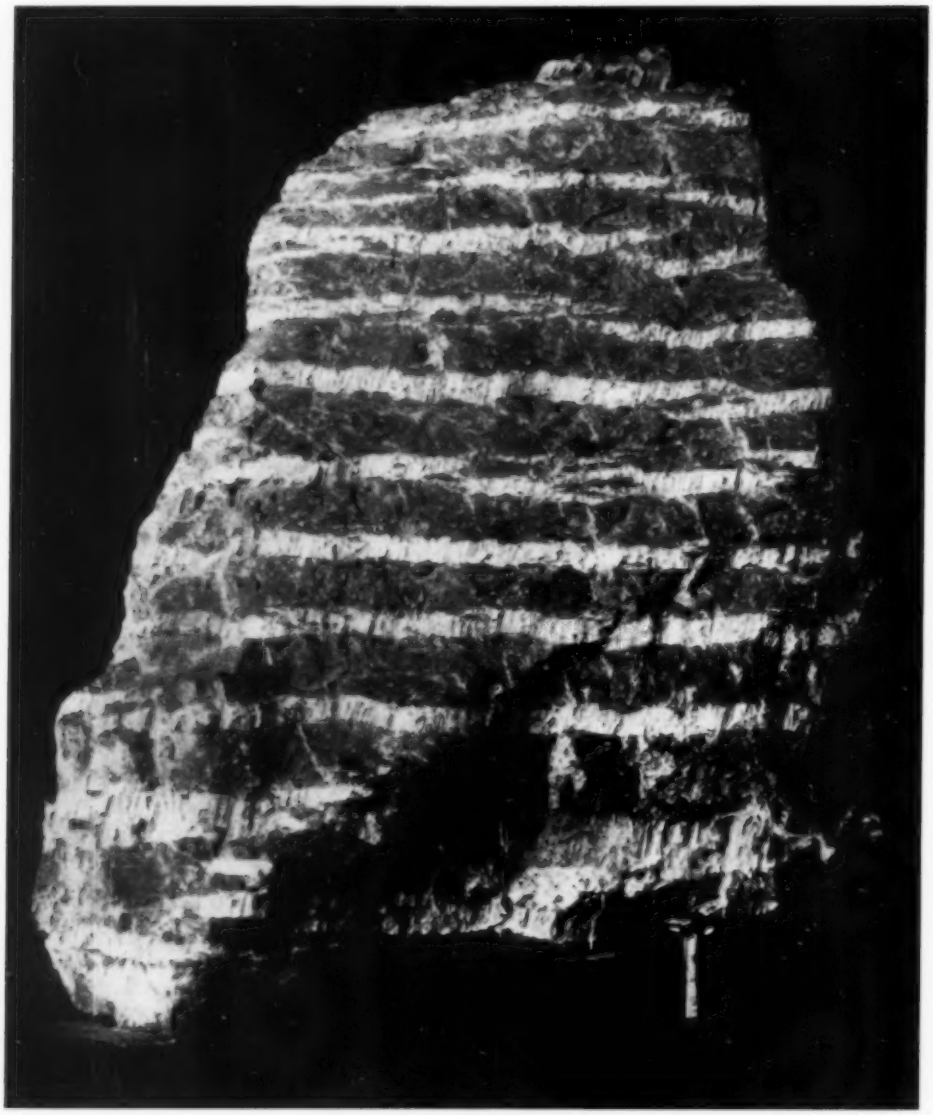
The operations require an enormous amount of auxiliary service. Operations are forever on the move. Compressed air lines for drilling must be taken up and relocated. The same thing applies to pumps, power lines, railway tracks, telephone lines and many other items. All equipment is subjected to "heavy duty" with the necessity of constant inspection and repair.

With the electrification of the mining operations, the pit has taken on a vastly different appearance. Power transmission lines now run everywhere. Poles of varying heights and weights, together with the portable steel towers, are in evidence all over this pit.

At Asbestos the Canadian Johns-Manville Company mines employ a somewhat different method to other properties, using what is known as open cast work. After blasting the rock, the material is picked up by huge steam-shovels and loaded into large gondola cars. These cars are drawn directly from the quarry up to the mill and the rocks dumped into a large bin, from which they pass into the crushers. These crushers are direct motor driven and will take a rock

A close-up view at two of the cable-way stations on the King property of the Asbestos Corporation at Thetford Mines. Some conception of the size and extent of the system is gained from this intimate view of a detail of it.

In olden days, the French-Canadian women in the asbestos region were fully aware of the facility of spinning and weaving asbestos fibres and made many articles of clothing out of them through old-fashioned spinning wheels and looms. A few of the French-Canadian women of to-day still do a little of the spinning on their grandmother's spinning wheels. This is a recent photograph taken in the asbestos region. The woman is carding the asbestos fibre preparatory to spinning it on the wheel.



Specimen showing ribbon structure of asbestos rock and veins of crude of lighter colour than the rest of the rock.

approximately 5 feet x 2 feet x 2 feet, weighing several tons. After going through the primary crusher, the material is again passed through a crusher. From there it is carried by elevator or buckets to the dryers, from the dryer through the mills where the fibres are separated from the rock by air suction, and graded and bagged and otherwise prepared for the market.

Going from Asbestos towards Thetford Mines, on the way is a property operated by the Nicolet Asbestos Company. This property is worthy of mention because it lies between Asbestos and Thetford and thereby proves the continuity of the belt, or band, of asbsetos from one district to the other.

From Nicolet we proceed to Black Lake where some of the properties of the

Asbestos Corporation and the Johnson Company are found.

Proceeding from Black Lake to Thetford, we pass the Maple Leaf property of the Asbestos Corporation, and come to what is going to be the most modern asbestos mill in the world. This mill is now being erected by the Johnson Company who are probably the pioneers in the asbestos field, the properties having been operated for many years by the late Andrew Johnson, who may be called the "Father of Asbestos". The method of milling asbestos is best illustrated by this mill, and a number of the photographs deal with the process.

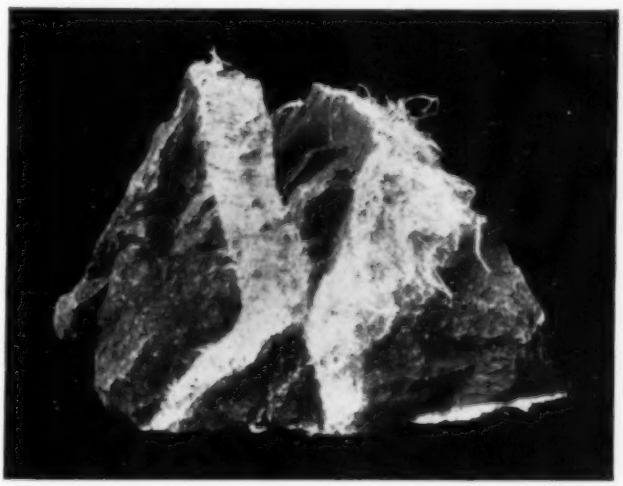
From the Johnson property we proceed to Bell's. Bell's is known as the most productive asbestos mine in the world. A view in the Bell pit shows the actual asbestos veins in place. These veins, or seams, are found between the mother rock, and the better and wider seams are carefully put aside awaiting the cobbing process. The pits have endless stringers or smaller veins, and these are used in the milling process, being too small to break away from the mother rock or matrix. The rock and everything it contains is passed through the mill where the separation takes place.

Mines neighbouring Bell's are those of the Johnson Company and the Asbestos Corporation. A tremendous wall of rock separates the Johnson pit from the Bell pit, and this at a later date, when the Johnson new mill and quarrying methods have been finished, will be removed. In former years a high wall known as the "Bonne Femme" existed between the Bell and King pit. This wall was dynamited and thousands of tons of rock containing the asbestos were blown into these pits, which in the interval have been disposed of so that the illustration shown on page 500 gives a view of both pits. The King pit is the deepest quarry of them all, being 450 feet at the lowest spot.

The Asbestos Corporation operates King's pit by the greatest cable-way system in existence. Some idea of the magnitude of the operations carried on may be gained by the fact that over 7,000 tons of rock are hoisted daily out of this one pit by cable, and that approximately 15,000 tons of rock are handled every day at the various properties of the Asbestos Corporation. From derrick to derrick there is a span of over 1,400 feet at King's pit.

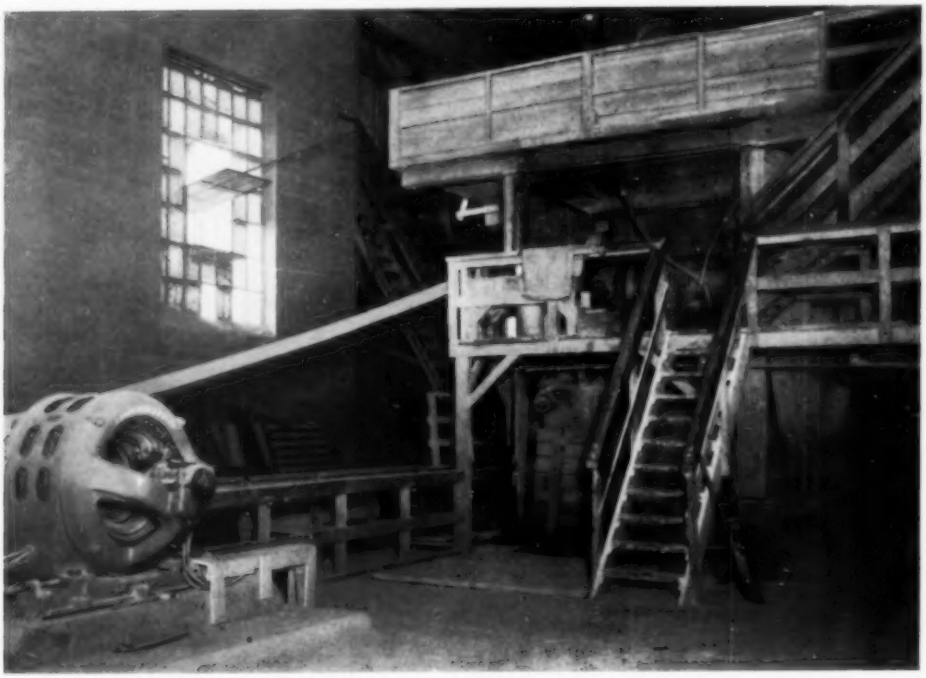
From Thetford we continue to Broughton, passing such places as Robertson and other small towns where formerly asbestos was mined, and visit the property of the Quebec Asbestos Corporation. This property is owned by the Philip Carey Co. of Cincinnati, who are manufacturers of asbestos goods, so that their raw asbestos requirements are supplied by their own mines. The properties at Danville are owned by the Johns-Manville Company, and

(*Continued on page 522*)

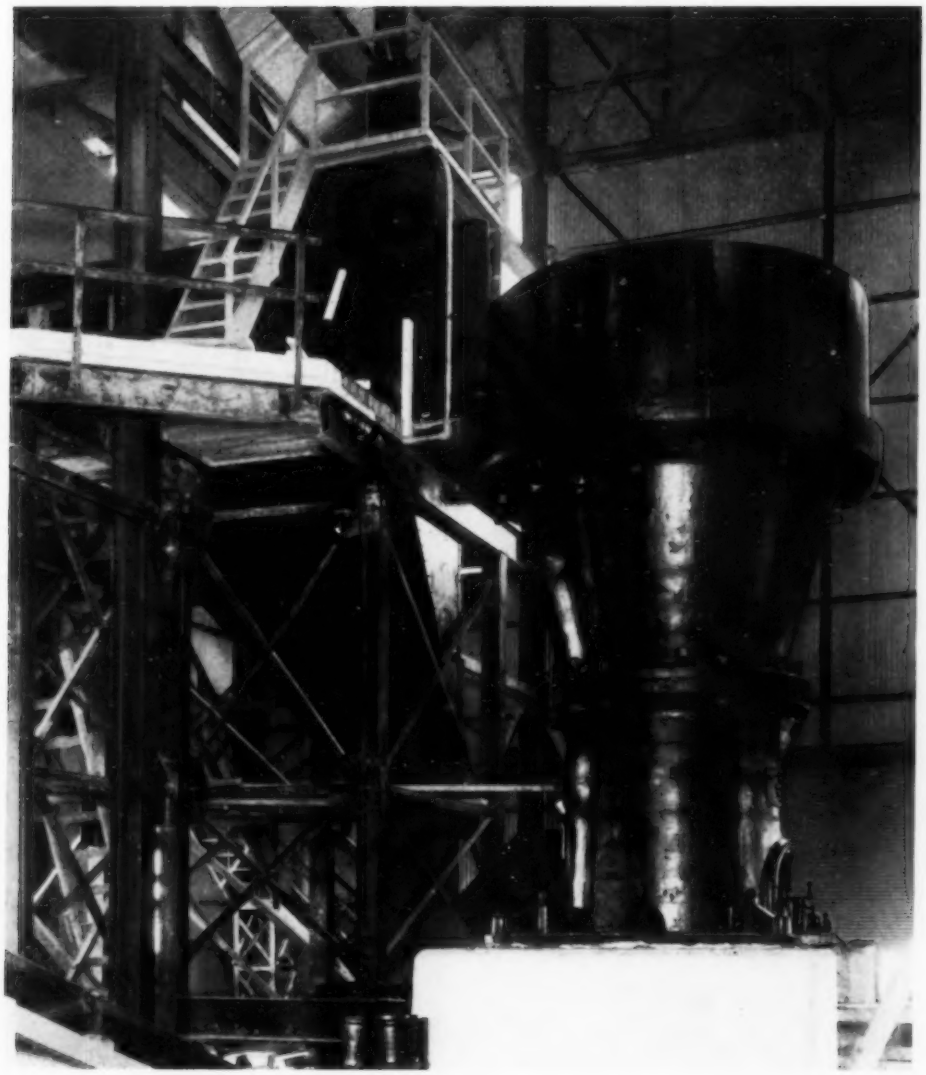


Asbestos rock, showing veins of crude asbestos facing each other. The veins here shown are illustrative of the most valuable form in which asbestos is found.

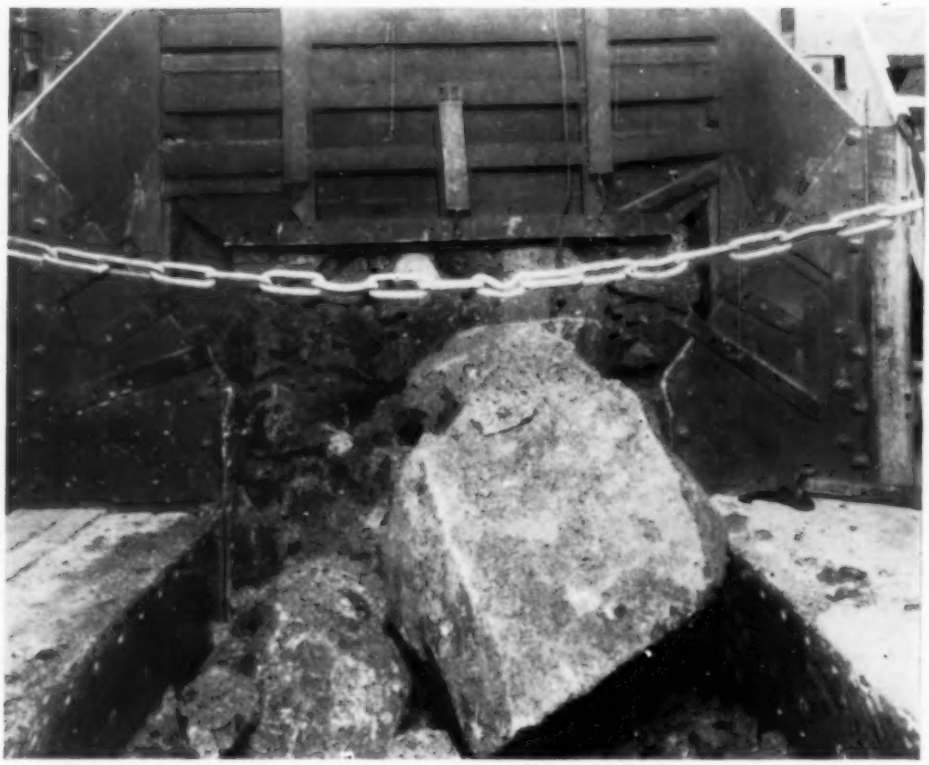
Milling processes and machinery vary somewhat, but this and the succeeding photographs, the majority of which were take in Johnson's Mill one of the most modern at Thetford Mines, give a fair general idea. Above is a photograph of the new mill referred to.



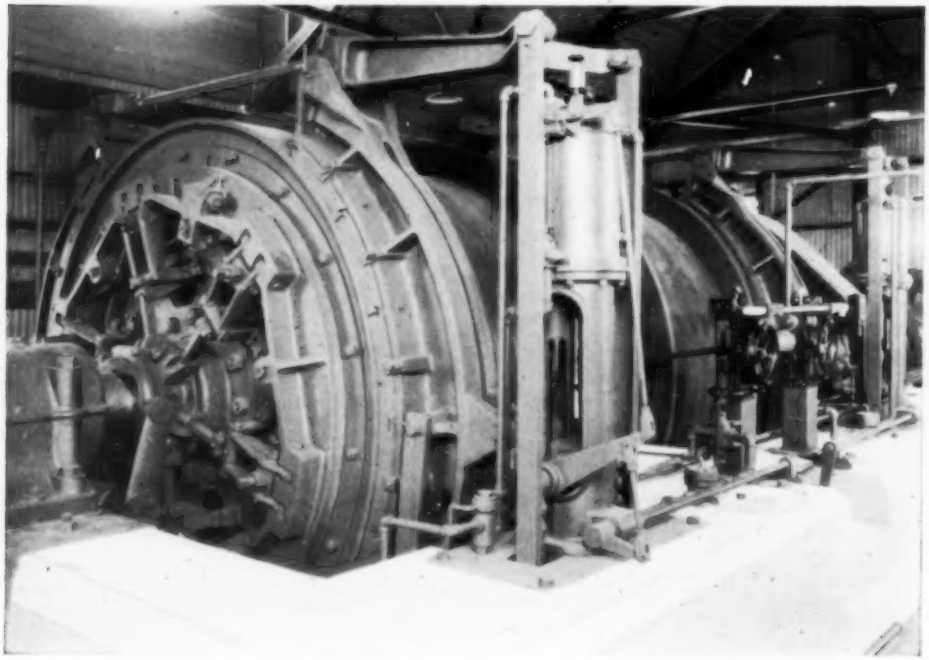
The photograph gives an inadequate impression of the immensity and power of this rock-crushing machine. This particular machine is at the plant of the Canadian Johns-Manville Company. Rocks of all sizes up to tons in weight pass into its invincible jaws, which are in the rear of the stairway.



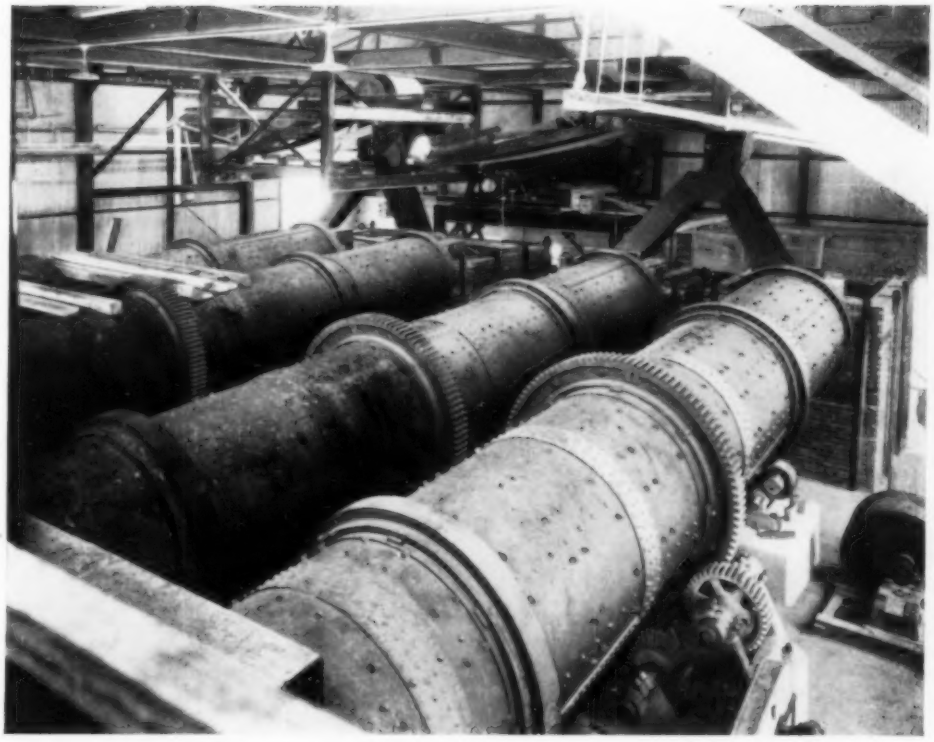
The mined rock is first dumped into the primary crushers, sometimes direct from dump cars and sometimes into bins from which supplies for the crushers are released as required. The primary crushers reduce the rocks to something approaching uniform size. From the primary crusher, the crushed rock travels upwards either on endless belts or buckets to smaller crushers, and from thence to the "drier-house." Above is a primary gyratory crusher, with a capacity of 500 tons per hour. This crusher weighs over 130 tons and requires a 150-horse-power motor to drive it. The previous crusher illustrated is of the "jaw" type, the rock passing between a pair of immense slabs of corrugated steel, one of which is stationary, the other, in constant motion, crushing and squeezing the rock against the stationary slab, this crusher is in the Johnson Mill at Thetford.



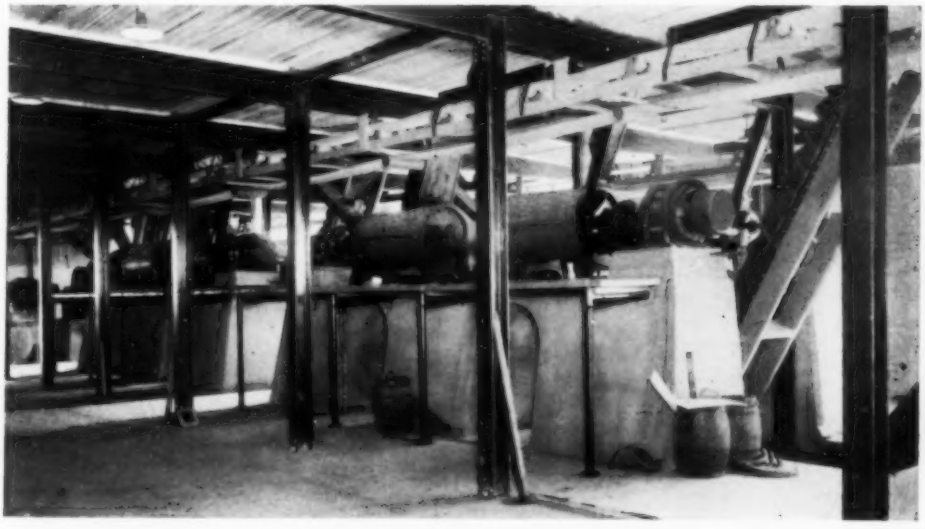
Here is the gateway facing the mouth of the giant crusher of the Canadian Johns-Manville Co., with rocks of all sizes ready to pass through. It was estimated by the engineers on the spot at the time the photograph was taken that the rock in the foreground weighed several tons. In less than a minute it would be ground between the jaws of the crusher to a size used in road surfacing.



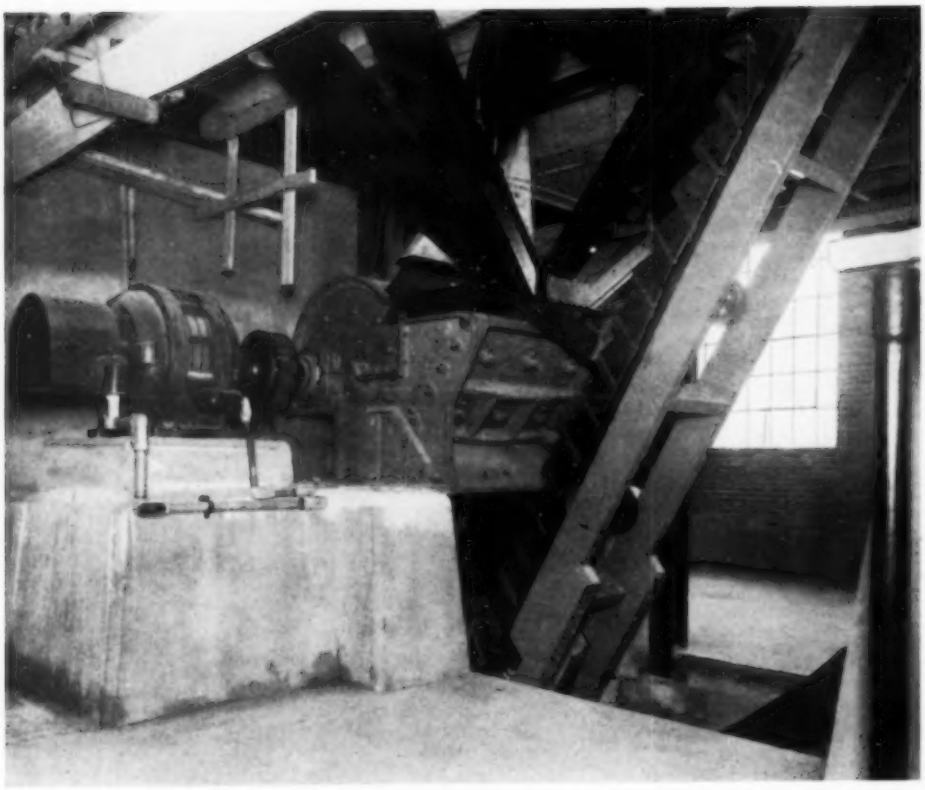
A gigantic electric hoist at the Johnson mill, capable of hauling several tons at the rate of 750 feet per minute.



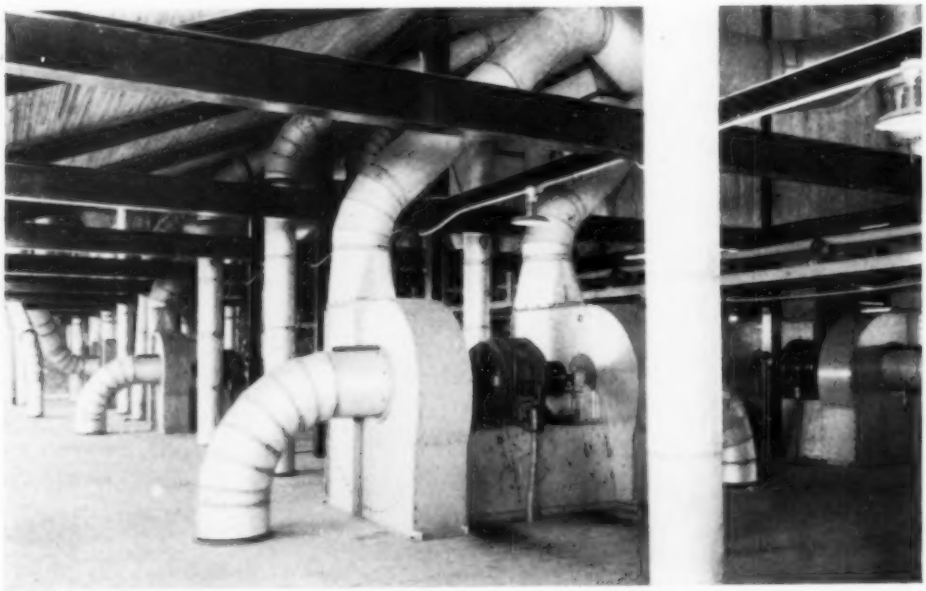
Drying drums at the Johnson mine. After passing through the large rock crushers, the rock being then of about the size of ordinary stove coal, it is passed by conveyors into these huge drums, constantly revolving and heated by powerful furnaces. By the time the broken rock has passed from one end of these heated tubes to the other, and is on its way to other processes, it is thoroughly dry. Unless quite dry asbestos rock is not suited for passing through the various mill processes.



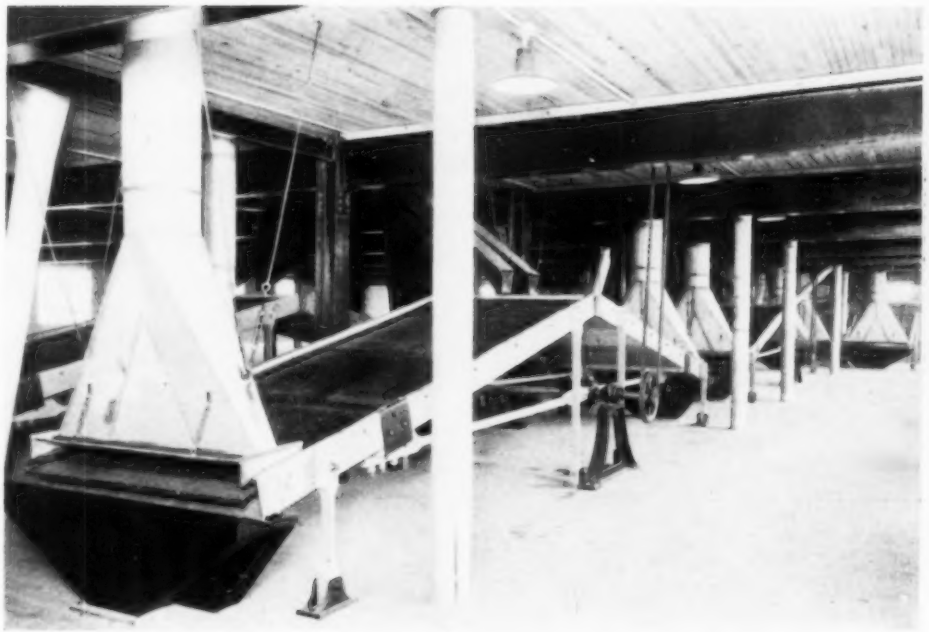
"Jumbos," or machines used for finer crushing of small asbestos rock at the Johnson Mill.



An endless bucket-line conveying crushed rock from the smaller type of crushers to other mill processes.



A blower system, whereby fibres are sucked up before going into the collectors, which grade or sort the various lengths.



A system of shaking screens, conveying asbestos fibre to blower apparatus, which makes separations as to size and quality.

A battery of revolving machines used in separating or grading asbestos fibres.

A storage bin with a capacity of 50,000 tons of crushed rock at the Beaver Mine of the Asbestos Corporation.

Representatives of the feminine sex are rarely seen in or about the mines, mills and other properties of the asbestos companies, but here is an exception in the mine plant on the outskirts of Thetford mines, where a large number of young women are engaged in the process of separating the highest grade asbestos from less valuable grades. The process is known as "cobbing" and the separation is done by means of a small but heavy hammer. The number of bright and healthy-looking French-Canadian girls in this department is always a surprise to visitors. The photograph shows only a section of the cobbing room.

Here is a near view of one of the "cobbers" with the cobbing hammer poised on its way to split the piece of asbestos. On the morning this photograph was taken the young lady had accidently hit the thumb of her left hand with the hammer, although this sort of accident rarely occurs amongst the workers, who become quite skilled in the wielding of the hammer.

One of the refuse dumps of the Asbestos Corporation. Dumps of this sort are scattered all over the asbestos region. The average recovery of commercial asbestos from the rock taken out of the mines is six per cent. so that 94 per cent of the mined rock eventually goes to the making of these large dumps. No commercial value has as yet been found for this refuse.

(*Concluded from page 513*)

the Bell property at Thetford is owned by the Keasbey & Mattison Company, so that the three largest asbestos manufacturers in the United States have their own source of supply. The Asbestos Corporation, Johnson Company and Nicolet Asbestos Company, being independent, supply the other manufacturers.

At the Quebec Asbestos Corporation, in East Broughton, different methods of mining are carried on. The deepest point of their quarries is 125 feet and the area of the pit covers approximately 10½ acres of the total property owned, consisting of 500 acres. This Corporation uses both steam and electric shovels and locomotives on their property, and hoists about 1,000 tons of rock per day. The rock is of a soft nature.

From the pits the material is elevated through a tunnel 400 feet long to a crusher which handles about 100 tons of rock per hour. This crusher feeds into a storage bin and from there the material is passed through the regular milling operation into a mill of 1,000 tons capacity. From this one property, approximately 40,000 tons of fibre are produced in a year, although no grades higher than the better class of shingle and paper stock are produced.

At the present time the largest storage bin in the world for asbestos ore is being built at Broughton, and when finished it will have a capacity of 150,000 tons. It is interesting to note that the pits have been worked for about 25 years without any noticeable diminution of the veins.

THESE two waterfalls have, so to speak, a distinct family resemblance, even if one is in Canada and the other is in Scotland. The fall at the right is the Fairy Fall, six miles from Hamilton, Ontario, and

the fall at the left is on the outskirts of a small town Port-Glasgow, on the River Clyde, about 20 miles from the city of Glasgow. In olden days, before the channel of the river was deepened to Glasgow itself, Port-Glasgow was the actual shipping port of the big city.

Canadian Government Motion Picture Bureau Photograph.

The arrival of H.M.A. R-100 at St. Hubert Airport at the break of dawn on the morning of August 1st. The ship is seen nearing the mooring tower preparatory to dropping mooring lines. Search and signal lights were still in operation when this remarkable photograph was taken.

The Story of the R-100

HIS Majesty's Airship R-100—variously pronounced, as suits the fancy, "R-one hundred", "R-a hundred", and "R-hundred"—largest and in other ways the greatest dirigible in the world, ended her historic flight, England to Canada and back, at her home port, Cardington, on August 17th, at 6.35 a.m., Montreal daylight-saving time.

She had travelled 3,200 miles on the return journey and had been in the air for 57 hours and 5 minutes having left Montreal at 9.30 p.m., August 13th. Her time for the eastward trans-Atlantic crossing was longer than the mark set by the Graf Zeppelin in 1929. Adverse winds and rain over the Atlantic delayed her.

At the mooring mast at Cardington, Lord Thomson, Britain's Air Minister, greeted Wing-Commander Colmore, flight representative of the Air Ministry, and the Director of Airship Development, with the words: "I welcome you home from Canada and congratulate you on having accomplished the first stage in the development of British airships whose contribution to Imperial air communications must be of incalculable significance".

Going west, the ship cast off from the mast at Cardington at 10.48 p.m., Montreal daylight-saving time, and moored to the mast at St. Hubert Airport, eight miles from Montreal, at 5.37 a.m., August 1st, 78 hours 48 minutes later, ending a trip of 3,360 miles at an average speed of 44 miles an hour, and securing for Great Britain the westbound airship trans-Atlantic record.

A smooth and fast voyage across the Atlantic was disturbed by an electrical storm between the cities of Quebec and Montreal which caused minor damage to a stabilizing fin and a reduction of speed. The slowing-up in turn caused the ship to reach the airport only long after dark, so that a further delay of several hours was due to the fact that she had to cruise about Montreal waiting for the dawn before starting mooring operations at a strange mast.

Canadian Government Motion Picture Bureau Photograph.

Visitors entering the R-100 from the mooring mast at St. Hubert Airport. There was a gap of about 20 inches between the top step at the mast and the entrance platform of the airship, and as the gap was nearly 200 feet in the air some visitors were inclined to be nervous.

When she docked two hundred journalists at the airport flashed a million words around the world, and a small army of photographers of all types got into action. A mile of film was taken by Canadian Government photographers, then and at other periods of the visit.

The former west-bound airship record was held by the airship ZR-3—now the U.S.S. Los Angeles—which flew from Friedrichshafen on Lake Constance, Germany, to Lakehurst, N.J., in 80 hours and 9 minutes. The time taken by the R-100 beat that of the Los Angeles by one hour and 20 minutes for a point-to-point crossing.

Welcomed to Canada as a gesture of British kinship, a triumph in aeronautics, and a great experiment probably leading

(This record of the historic flight was condensed from the Montreal newspapers.)

to the linking of the British Isles and the Dominion with a fast airship line of high commercial value, nearly 800,000 Canadians visited her at the airport during her stay of 13 days, and probably a million and a half more watched for and saw her on a two-day flight across Ottawa, Toronto, Niagara Falls and other Canadian points, prior to her start on the journey home. Not since the close of the Great War did any event so deeply stir the interests, prides and affections of the Canadian people.

A railway station was specially built at Montreal by the Canadian National Railways to facilitate departure and arrival of special trains loaded with sightseers. Every road leading to the airport was laden with motor cars moving two and three abreast. A Quebec Government census recorded the number of cars passing through the airport during the stay of the R-100 as 131,977, with a total passenger list of more than half a million. Hundreds of small children set out to walk the eight miles from Montreal to the airport, and many, lost, hungry and weeping, were found and cared for by police and soldiers.

Batten Limited, Photograph.

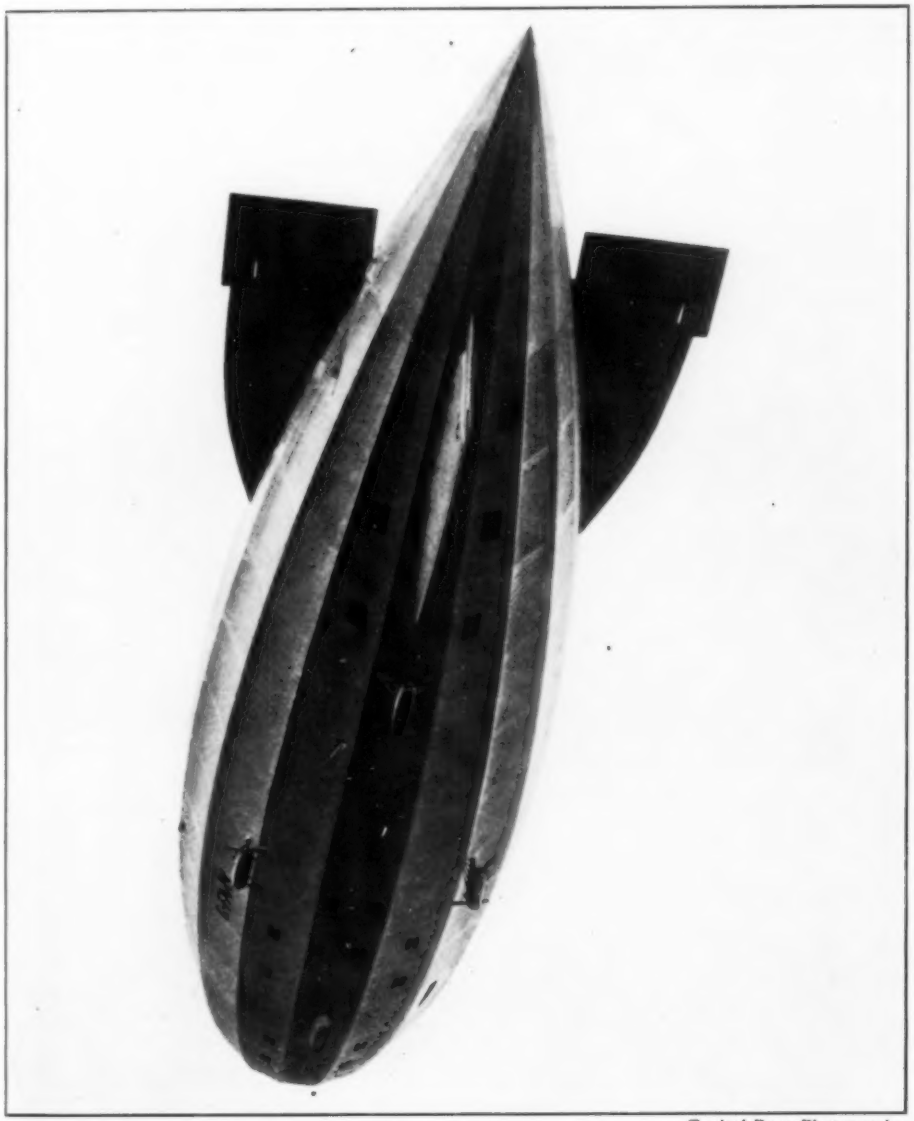
The mooring mast at St. Hubert Airport, with the R-100 moored. The mast is 200 feet high. At the top is a metal cone into which the nose of the ship is drawn and then locked. The cone revolves at a right angle to the mast, and can be adjusted to the swing of the ship according to the prevailing winds. Entrance to the R-100 was from the gallery of the mast to an opening beneath the nose of the envelope.

Over a thousand city police, officers and men of cavalry and infantry regiments, doctors, nurses and first-aid experts, were under canvas at the airport to deal with traffic matters and difficulties arising therefrom. Traffic regulations had been scientifically mapped. There were no confusions and no disorders, and no serious accidents, although there were a number of minor casualties and a few arrests for minor infractions of the law.

Round the airport, in fields where cows grazed at normal times, there sprang up a temporary city of canvas and wood to provide refreshment and entertainment for the crowds.

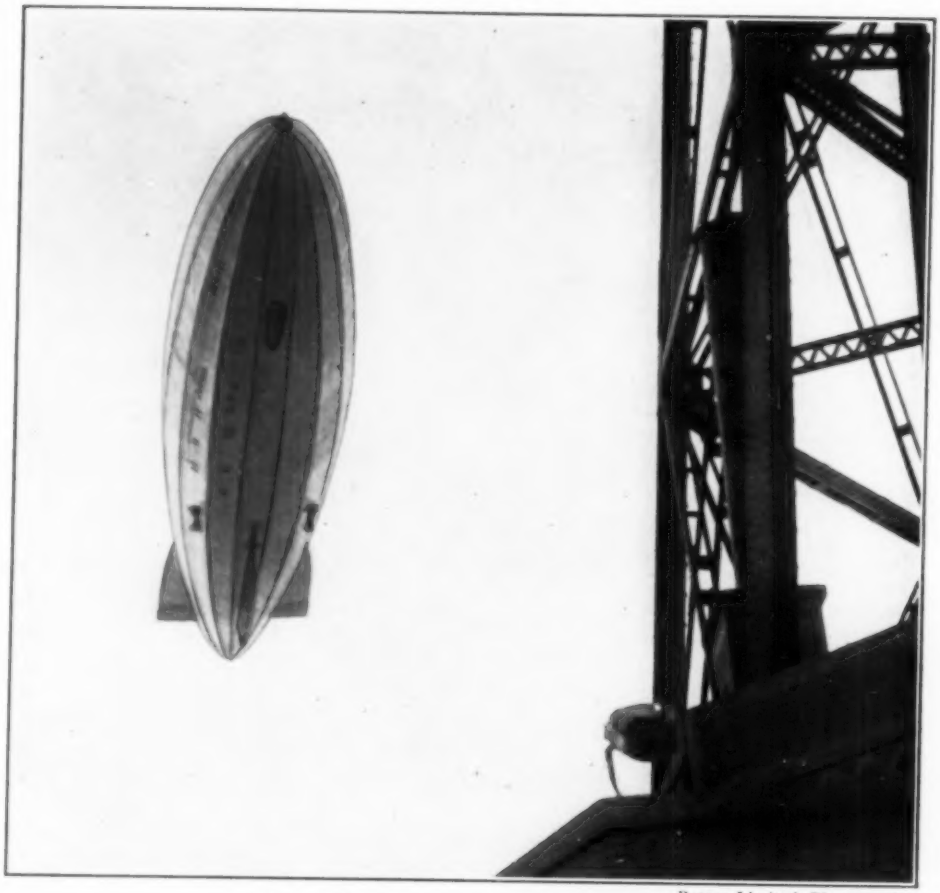
The passengers, officers and men of the ship were treated to a continuous round of entertainment while in Canada, including a series of banquets and lunches. Amongst the hosts were Governor-General Viscount Willingdon, Premier R. B. Bennett and Mayor Camillien Houde of Montreal.

Radio broadcasting about the R-100 was practically without cessation day and night while the ship remained in Canada, much of it on national and international hook-ups, and included radio-telephone messages to and from the R-100 during her Canadian flight. Toy models of the great airship sold by the thousands, as also



Topical Press Photograph.

The above photograph, and the four immediately following, "close-ups" of the R-100 taken at St. Hubert Airport, are presented here with an idea to giving impressions of the great ship from different angles. The photograph on this page shows the ship as seen from almost directly beneath.



Batten Limited, Photograph.

As seen from a point on the mooring mast.

Chandler, Photograph.

Leaving for the return trip to England.

Canadian National Railways, Photograph.

Nearing the mast on the return from the side-trip taken over Canadian territory.

Canadian National Railways, Photograph.

Moored, with the admiring crowds gazing upward.

Canadian Government Motion Picture Bureau, Photograph.

Group of airship's officers and officials taken just after arrival of R-100 at the base of the mooring mast at St. Hubert Airport. In the group, left to right: Squadron-Leader Johnston, Navigating Officer; Lt.-Commander Gibblett, Meteorological Officer; Mayor Houde, of Montreal Lt.-Commander Sir Dennistoun Burney, Designer of the R-100; Wing-Commander R. B. Colmore, Director of Airship Development, British Air Ministry; Col. the Hon. J. L. Ralston, former Minister of National Defence; Major E. H. Scott, in charge of the flight; Maj.-Gen. A. G. L. McNaughton, Chief of the Canadian General Staff; Lieut. G. F. Meagher, Second Officer of R-100; J. A. Wilson, Controller of Civil Aviation, Canada; Squadron-Leader R. S. Booth, captain of R-100; the Mayor of St. Hubert.

did photographs and picture postcards. A new song, "The Song of the R-100", was played or sung at numerous gatherings and broadcast dozens of times. The poets out-poured verse. The Sun Life Assurance Company placed a sign 150 feet long and 30 feet wide, with the words, "Welcome to Canada, R-100", at the top of the company's 22-storey building in Montreal. Many flags flew from the roofs of the metropolis, and at night various schemes of electrical illumination flashed their signs of welcome into the sky. Mailed and cabled greetings were exchanged between King George and the Governor-General.

The official list of the R-100 crew and passengers, a total personnel of 51 was as, follows:—

Sir Dennistoun Burney, designer of the ship and director of the Airship Guarantee Co.

Wing-Commander R. B. B. Colmore, O.B.E., R.A.F., Director of Airship Development in the Air Ministry.

Major G. H. Scott, C.B.E., A.F.C., R.A.F., Assistant Director of Airship Development (flying).

Squadron-Leader R. S. Booth, A.F.C., Captain of R-100.

Squadron-Leader Johnston, R.A.O.F., O.B.E., A.F.C., Navigating Officer, R-100 and R-101.

G. F. Meager, A.F.C., first officer.

Flying Officer Steff, R.A.F., second officer, F. McWade, resident inspector, A.I.D., R. A. W., Cardington.

M. A. Gibblett, Superintendent, Airship Services Division, Meteorological Officer, Air Ministry.

W. Angus, foreman engineer; R. Ball, engineer; C. Broughton, rigger; H. W. Clark, engineer; G. G. Cutts, rigger; R. L. Deverell, engineer; C. Flatters, engineer; F. Gaye, engineer; F. L. Sgt. Greenstreet, chief coxswain; T. Hobbs, assistant coxswain; L. C. A. Hunt, engineer; J. Howitt, engineer; A. H. Savidge, chief steward; J. F. Meegan, cook; F. Hodnett, assistant steward; D. Elliott, engineer; G. E. Long, assistant coxswain; N. Mann, charge-hand engineer; H. Millward, engineer; L. A. Moncrieff, assistant coxswain; C. H. Rumsby, rigger; G. R. Scott, rigger;

A. F. Stupple, charge-hand engineer; J. M. Stuargeon, engineer; G. Watts, charge-hand engineer; F. Williams, rigger; A. Wiseman, rigger; S. Keeley, charge-hand; A. Disley, operator; G. K. Atkins, operator. Attached — A. Eldridge, clerk to Captain R-100; H. Addinell, engineer; S. C. Armstrong, rigger; R. J. Burgess, rigger; A. F. Burke, engineer; L. Hall, engineer; D. Kershaw, rigger; E. R. Patterson, rigger; D. Simmonds, engineer; C. Watson, engineer; H. Wilson, engineer; C. W. Larkins, operator.

The airship crews were entirely civil personnel with the exception of two officers and one N. C. O. of the Royal Air Force who are seconded for duty on airships.

On the return journey, the R-100 carried a few non-official passengers, including several press representatives.

These are the official logs of the trans-Atlantic flights:—

WESTBOUND

First Day

(July 29th, British time,
July 28th, Canadian Time)

"R-100 took off from Cardington mooring tower at 03.48 hours British summer time, on Tuesday, July 29th, and shaped course for Liverpool, flying at about 1,200 feet. We had on board 10,440 gallons of fuel and 5.4 tons of ballast.

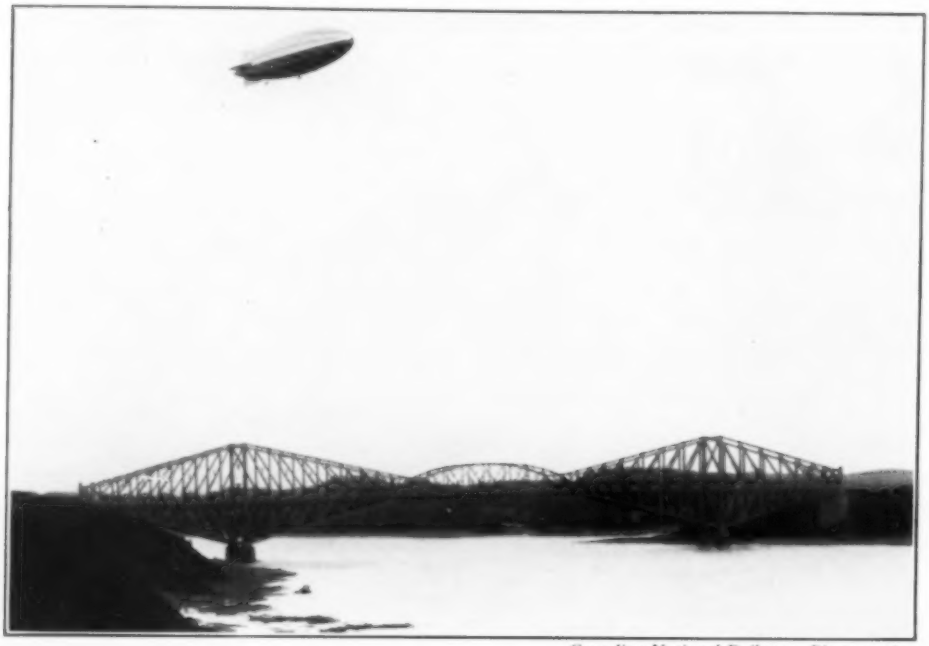
"Wind was about 30 m.p.h. south-westerly. Speed made good 46 m.p.h. Everybody turned in except those on duty.

"Chester was passed at 06.00 hours and the ship's course was then set for the Isle of Man, passing over Liverpool en route. Mull of Galloway 09.00 hours, sea smooth, we hoped to pick up an easterly drift in two or three hours. Passed the Glasgow-Belfast boat at 09.30 G.M.T. also a couple of drifters. Squadron-Leader Booth started exposing the petric dishes, donning rubber gloves for the purpose. These exposures will be continued throughout the flight. At 10.00 to 10.15 hours a wonderful view was obtained of the northern Irish coast, cut short by a bank of intensely white low cloud.

"Our decision to proceed north of Ireland was taken, to get north of a depression passing eastward just north of Ireland. This we have done and at 10.30 hours are just passing the centre of the depression. The alternative of shaping a course to pass south of Ireland

Canadian National Railways, Photograph.

Part of the constant stream of Canadian passengers of the R-100 at St. Hubert Airport.



Canadian National Railways, Photograph.

The great dirigible passing over the Quebec Bridge a few miles west of the city of Quebec. In less than an hour after this photograph was taken, night fell and the R-100 ran into the thunderstorm which caused damage to one of her fins and delayed her arrival at Montreal.

Chandler, Photograph.

The damaged fin was repaired at St. Hubert Airport by members of the crew of the R-100. As the workers tore off pieces of the damaged fabric and threw them to the ground, spectators scrambled for the pieces as souvenirs. The photograph shows discarded pieces of the fabric dropped from the part of the ship where the men are working.

would have been almost impossible owing to very strong head winds. We have probably saved a day by this decision, illustrating the importance of good weather charts.

"All on board are now settling down to ship routine. Cards and sleep are the most popular methods of passing the centre of the depression.

"Everybody has been able to keep warm comfortably without recourse to flying kit, and it has not been necessary to switch on the electric radiators in the passenger accommodation.

"At about 17.00 hours a whale was sighted on the port side.

"Gibblett reports that steamships are evidently making a special effort to give a good reporting service. We have located a further depression from these reports moving north-eastward from the vicinity of Bermuda. We hope to make use of this depression tomorrow when we meet it. We shall manoeuvre to pass just north of this depression.

"No complaints from anybody about anything. Food has been really excellent.

SECOND DAY

"At midnight July 29-30th, 11 p.m., ship time, the clocks having been put back one hour, our position was 53° 05′ N. 21° 0′ W. In the first 20 hours we have used just over 2,200 gallons of petrol, which is a good start.

"At about 05.30 G.M.T., the liner Ausonia was passed. She left Southampton on Friday last. Further ship reports have been received and we are goind to edge north to get on the north side of the depression located and mentioned yesterday. Our ground speed is increasing and by noon our ground speed had reached 85 m.p.h.

"After breakfast the two forward engines which had run without interruption from the start were stopped and examined, the forward and after engines in the after car being started up to replace them. Some spark plugs and a rocker brush were changed, otherwise the engines were in perfect condition.

"During most of the day the ship was flying in low cloud or fog, and this was turned to advantage by the collection of the water condensed on the outer cover, through funnel-shaped trunks connected by down pipe to the ship's water system. In this way it has been possible this morning to collect over two tons of water.

"In spite of low cloud and fog we have never been more than a few miles out in our dead reckoning position. It is now 5 p.m., ship's time. We decided to increase air speed as there is just a possibility of making Montreal to-morrow morning.

"Head winds increasing; no chance of landing Montreal to-morrow morning. Belle Isle sighted at 9 a.m., ship's time.

Chandler, Photorgaph.

A friendly tussle for a piece of the fabric of the R-100 dropped from the ship by members of the crew at work on the damaged fin.

Batten Limited, Photograph.

The R-100 passing over Montreal on the start of her side-trip over Canadian territory. To the left is St. James Cathedral, to the right the 20-storey building of the Bell Telephone Company, and in the centre is the new Sun Life Assurance Company Building which on completion will be 22 stories high and be the largest building in the British Empire.

Head winds for remainder of journey now almost certain and we will continue at present air speed.

"The sweepstake on the ship's day's run was won by Eldridge with the 1,095 nautical miles.

THIRD DAY

"At midnight G.M.T., 8 p.m., ship's time, our position is 52° 15′ N., 54° 0′ W., roughtly 3,286 miles travelled, 1,700 gallons of petrol remaining.

"Reports confirmed, and we must expect head winds for the remainder of the journey.

"Passing West Point, Anticosti, at 8 a.m. ship's time, passed over liner "Duchess of Bedford" and many surface craft. We have noticed that the wind is less in shore, and have decided to hug the left hand coast line for the remainder of the way to Quebec.

"We are now two miles from shore and our ground speed has increased by six m.p.h., flying at 800 feet. Passed Father Point at 11.54 p.m. local time. At 12.20 p.m. local time, damaged fabric of port fin as reported by special signal. Two hours later temporary repairs completed.

"Over Quebec at 5.50 p.m. local time, proceeding Montreal at 45 knots, air speed.

"At 9.30 p.m. local time passed through thunderstorm. Violent disturbed air currents. Ship's height varied rapidly between 1,500 and 4,000 feet. Slight damage to starboard fin otherwise ship O.K., avoided many thunderstorms.

"Dropped main wire at 4 a.m. local time August 1st. A good landing was made.

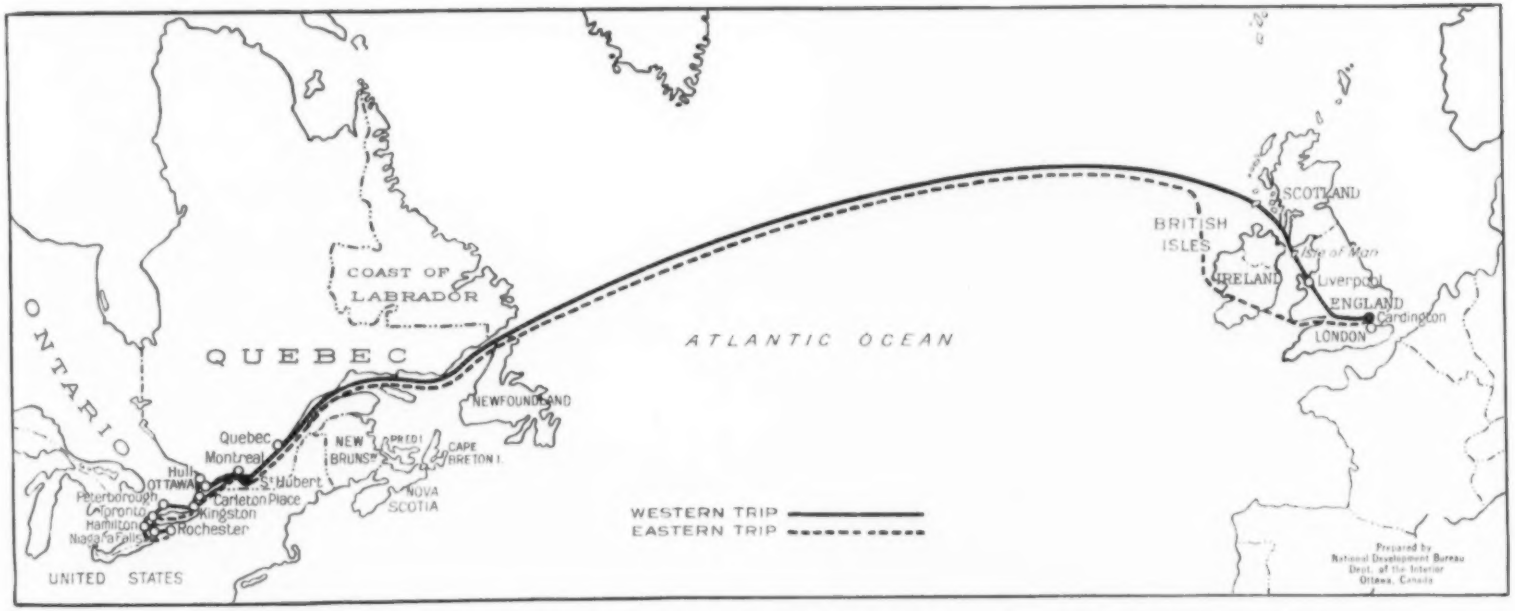
"Time in air about 78 hours, 48 minutes, of which 8 hours have been due to damaged fin. Crew have made a really good job of the repair. "Petrol on board, 5 tons."

EASTBOUND

WEDNESDAY, AUG. 13

Ship slipped at 9.30 p.m., local time from St. Hubert mooring tower, having aboard 9,585 gallons of fuel, 6.3 tons of ballast, 1.5 tons of drinking water and 56 persons, including 13 passengers, nine of whom were representatives of British and Canadian newspapers.

"The airship made a splendid getaway after passing over Montreal and



Sketch Map showing route followed by R-100 in her trans-Atlantic flight to Montreal, and return to Cardington, England.

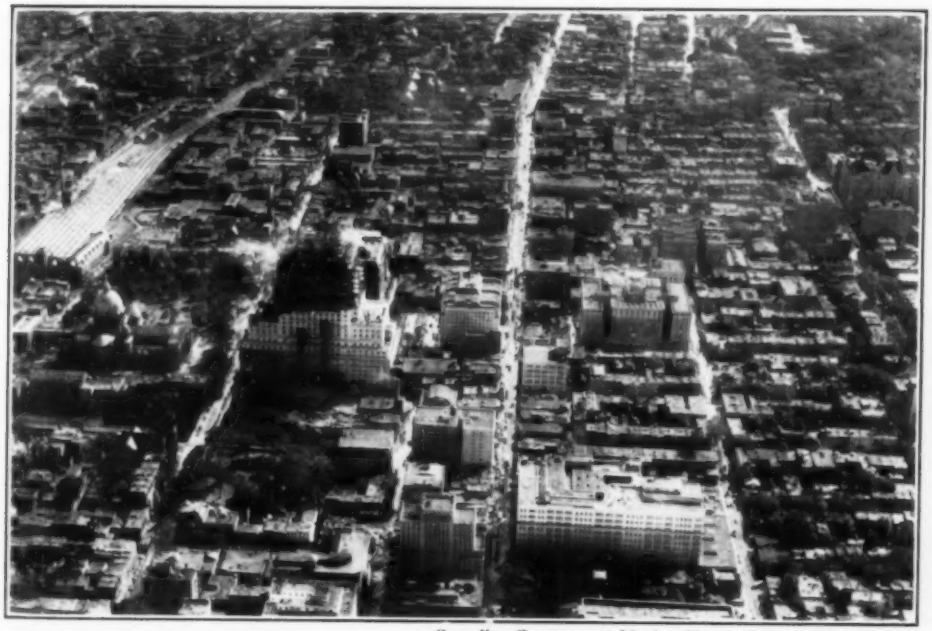
Canadian Government Motion Picture Bureau, Photograph.

The photographs in this and opposite page were taken by a Canadian Government photographer on board the R-100 during her two-day tour of Canadian points. The upper photograph is of Toronto and the lower one is part of the Thousand Islands district.

Canadian Government Motion Picture Bureau, Photograph.

Canadian Government Motion Picture Bureau, Photograph.

The upper photograph is of Niagara Falls, and the lower is of Montreal, both as seen from the R-100.



Canadian Government Motion Picture Bureau, Photograph.

shaped her course down the St. Lawrence. Quebec was passed at 11.45 local time. The progress of the ship over the St. Lawrence was entirely uneventful. The speed made was good, with only three engines running, favorable winds making this possible. At midnight, local time,

Chandler, Photograph.

One of the series of heavy carriages fastened to the R-100 while she was moored at the Canadian mast. These carriages helped to stabilize the ship as she swung in the wind. Occasionally the ship dragged these anchors about the field.

the ship's position was the southwest end of Green Island, having covered nearly 190 miles in two and one-half hours.

THURSDAY, AUG. 14

"Father Point was passed at 2 a.m. Favourable winds continued and Belle Isle was abeam at noon. The weather was fair, with a clear sky and no clouds. We covered the first 850 miles of the trip in 13½ hours. The westerly winds began to drop very rapidly as we got into the Atlantic, and, after a period of light winds, at about 2 p.m., a strong headwind was encountered from the northwest, associated with the depression which we approached from the southwest.

"By altering the course so as to move for a time in a south-easterly direction the maximum adverse effect of this unfavourable wind was avoided and later in the evening we found ourselves in the belt of favourable winds on the south side of the depression.

FRIDAY, AUGUST 15.

"Heavy rain and low clouds were encountered during the passage through the depression. We were steaming for about five hours at 60 miles per hour air speed, but were making good only about 25 miles per hour. About seven tons of ballast water were collected. While passing through the heavy rain the ship was soaked and some of the water found its way on board. Owing to this the electrical cooking apparatus was temporarily disabled. The outer covers still require improvement.

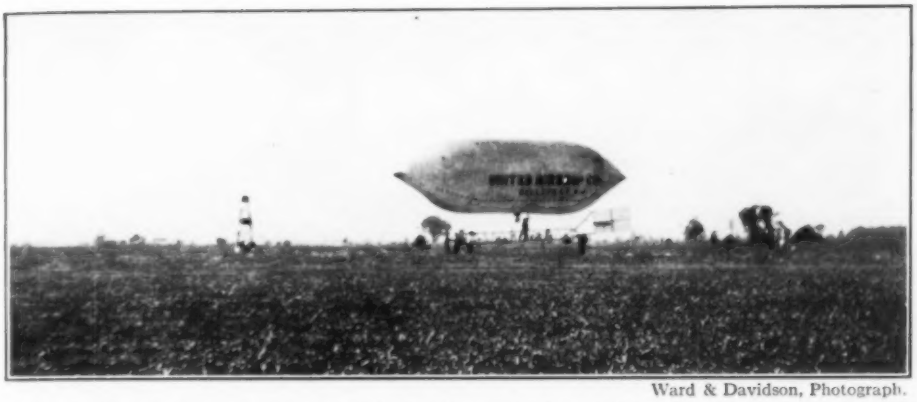
"At about 1 p.m., local time, the wind at the time being south, it was decided to lay a course to approach North Ireland rather than south, as was the first intention. We obtained the immediate benefit of wind lying to our starboard quarter, and we shall encounter westerly winds as we near the Irish coast. At 7 p.m., local time, we altered our course toward the coast of Ireland and expect to cross Galway coast between 2 and 3 a.m., about midnight local time.

"During the night we received a report from Cardington that southwesterly winds might be expected. We therefore decided to shape our course for Fastnet and proceed to our base via Lundy Island.

SATURDAY, AUG. 16.

At 3 a.m., G.M.T., we sighted Fastnet. Johnston has again made a good landfall. Lundy Island was in sight at 6.45 a.m., G.M.T. We passed Barry and Cardiff at about 7.45 and sighted Bristol and Cirencester. Dropped the main wire at Cardington 10.35, G.M.T. Our time in the air 75 hours 5 minutes. The fuel remaining totalled 3,200 gallons."

It was maintained by officers of the R-100 that between 12 and 15 hours



Ward & Davidson, Photograph.

Many persons had the impression that the R-100 was the first airship to visit Montreal, but as far back as 1910 an airship of the United Air Ship Company, Belleville, N.J., sponsored by the Wright Brothers flew over the city in an exhibition flight. Photograph shows the airship close to her mooring mast on the outskirts of Montreal. This airship was, of course, a small and crude vessel as compared to the R-100.

could have been clipped from the running time of the westward flight if no accident had been sustained, and arrival made according to schedule. They said that the weather between Ireland and Newfoundland had been favourable, though some of the worst possible conditions were encountered in the St. Lawrence. At one time, without warning, a strong upward air thrust lifted the airship from 1,500 feet to 4,000 feet in three minutes. So strong was the velocity of this impulse that not even the depression of the stern elevators would hold the ship down. Passengers and crew received the first jolt of the whole trip, and any loose fittings began to slide. The ship settled down again after this severe blow, and continued on a more even keel to Montreal.

Another record was established, when the R-100 was moored in 27 minutes from the instant that contact of the main wire was made with the ground until the release of compressed air in the tower top indicated that she was safely berthed. Major Scott paid tribute to Lieut.-Commander A. R. Pressey and his crew of 11 men for their achievement in creating this record.

Royal Canadian Air Force, Photograph.

This photograph of the R-100 was taken from a circling aeroplane at St. Hubert Airport. The black dots in the picture are visitors who came to see the great ship.

Canadian Government Motion Picture Bureau, Photograph.

One of the hangars at St. Hubert Airport with the R-100 in the near distance. The buildings in the foreground were used as headquarters for press writers and photographers and the small army of telegraph operators and others concerned with the dispatch of the news of the airship.

Nearly 300 men were needed to moor the Graf Zeppelin at Leburbrent on account of the absence of a mast.

The flight of the airship to Canada was undertaken as part of the British Air Ministry's development policy for airships with the object of testing out the reliability and behaviour of the airship on a long distance flight. Data was also acquired which will be of value in deciding upon future policy with regard to the development of airships for commercial purposes, with particular reference to speeding up communications amongst the

Canadian National Railways, Photograph.

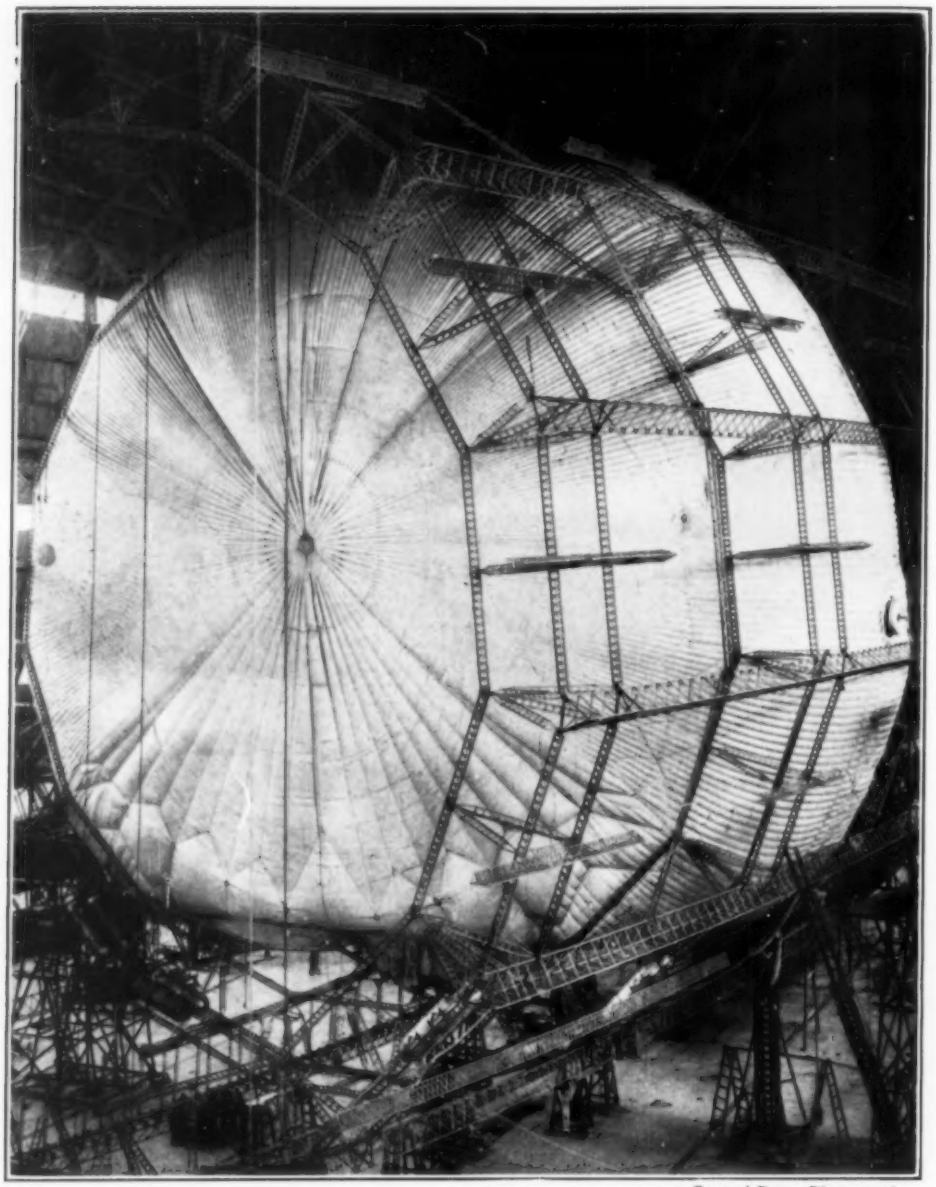
Above is a view of a special railway station built by the Canadian National Railways to facilitate the handling of crowds at St. Hubert Airport. Special trains ran every 10 minutes during daylight hours.

Canadian Government Motion Picture Bureau, Photograph.

Group on the steps of Rideau Hall, Ottawa, official residence of the King's representative in Canada, when officers in charge of the R-100 flight made official call on the Governor-General. First row, left to right: Wing-Commander R. B. Colmore, Director of Airship Development of the British Air Ministry; His Excellency, Viscount Willingdon, Governor-General of Canada; Viscountess Willingdon; Lt.-Commander Sir Dennistoun Burney, Bt., C.M.B., R.N., designer of the R-100. Immediately behind Lord and Lady Willingdon is Squadron-Leader R. S. Booth, Commander of the R-100, while the rest of the group consist of the Governor-General's official staff and aides-de-camp.

Canadian Government Motion Picture Bureau, Photograph.

Group of official passengers on Canadian flight of R-100. Left to right: Group-Captain Shedman, Chief Aeronautical Engineer, R.C.A. Services; Commodore Hose, Chief Naval Staff; Major-General McNaughton, Chief of the General Staff; Capt. Gordon, Director of Civil Government Air Operations; Wing-Commander Breadren, O.C., R.C.A.F.; Commander Edwards, Director, Canadian Government Radio Services, Capt. Badgely, Director, Canadian Government Motion Picture Bureau.



Central Press, Photograph.

One of the balloons inside the framework of the airship in the shed during construction.

British Commonwealth of Nations. The R-100 and R-101 are at present the largest airships in the world. The R-100 has a cubic capacity of slightly more than 5,000,000 cubic feet, and a gross lift of over 156 tons. During her speed trials she reached a speed of about 81 m.p.h.

She was built for the Air Ministry by the Airship Guarantee Company, a subsidiary of Vickers, Ltd., at Howden, Yorks, and was launched on December 16th, 1929. Since then she has carried out flying trials amounting to nearly 87 hours, including a duration test of approximately 54 hours, mostly in thick cloud. She has six of the latest Rolls Royce "Condor" IIIB engines as used in the Royal Air Force. Each of these engines develops 660 h.-p., so that the airship has a maximum available horse-power of 3,960.

Great Britain recognizes the necessity of establishing faster transportation services between the component parts of the Empire, and the construction of the R-100 and the R-101 represent definite steps taken in this direction. While the two ships are similar in appearance, they differ somewhat radically in other respects.

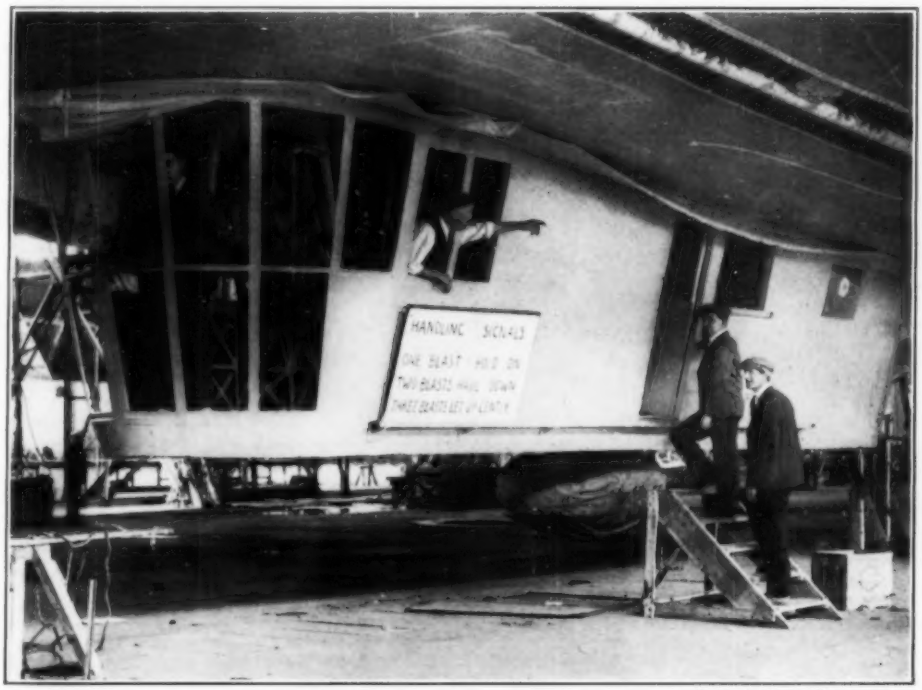
An examination of the R-100 reveals the following facts:

That it compares in size with the largest liners now making ocean voyages may be gauged from the following dimensions: Length, 709 feet; diameter, 133 feet; actual displacement, 156 tons; engine power, 3,960 h.-p.; maximum speed, 80 m. p. h.; cruising speed, 71.5 m.p.h.; carrying capacity, about 45 tons; range, 3.500 miles at 71.5 m.p.h. with full load; engines, six Rolls-Royce gasoline engines. The airship, which is of rigid design, has a displacement of about 5,000,000 cubic feet. The hydrogen gas which provides the lifting power is contained in a series of balloons within the hull.

It was the original intention to equip the vessel with either Diesel engines or hydrogen-kerosene engines, but at the time of construction neither of these types had been developed to a sufficient degree to enable them to be incorporated. While the R-100 was building, however, a new method of engine distribution and a fuel gas were developed which in the opinion of the builders would ,if adopted, have improved the performance of the vessel.

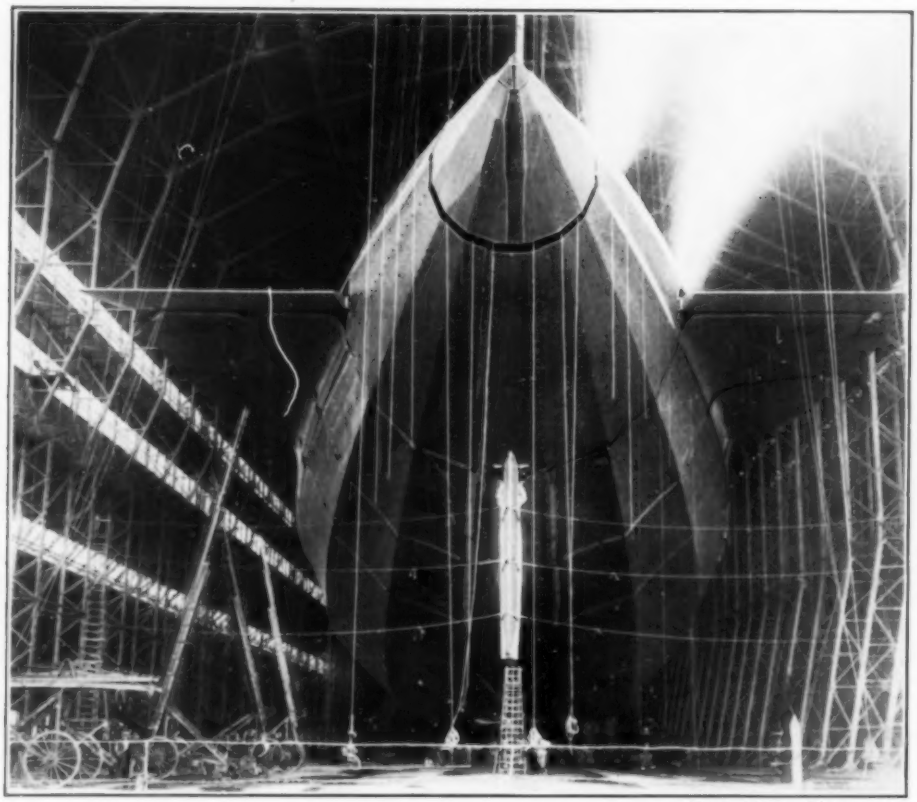
At the bow, there are the attachment fittings for the mooring mast and an observation station with windows for the use of the crew. Passing down the ship by an enclosed corridor designed for the use of passengers and lighted electrically the passenger coach is reached about 280 feet from the bow. This structure is slung inside the hull of the ship and consists of three floors, the bottom of which is allocated to the crew and the two upper ones to the passengers. This coach is surrounded entirely by a double wall, through which air is circulated to obviate the danger of any inflammable

(*Continued on Page 550*)



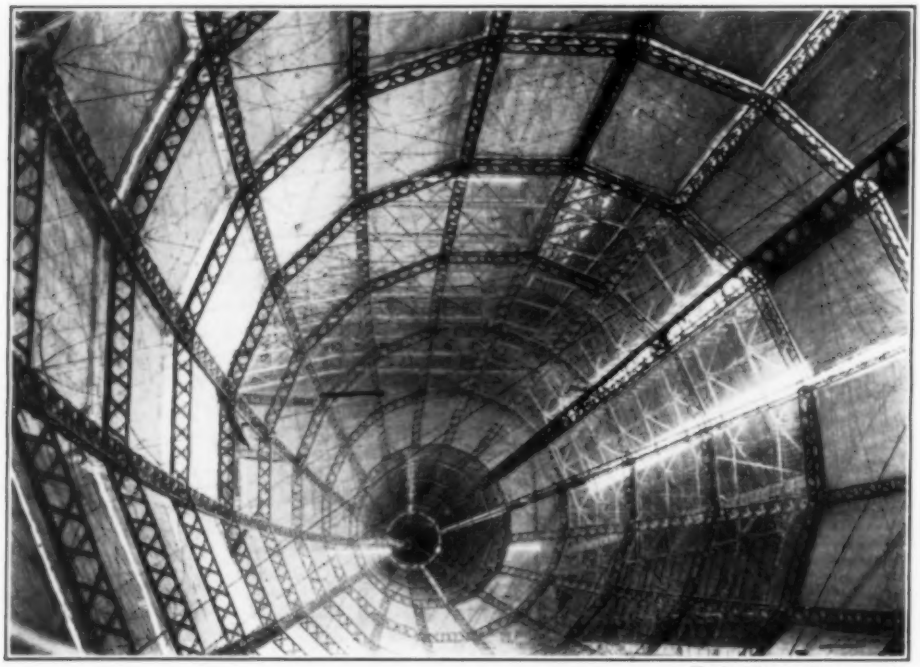
Topical Press, Photograph.

The control and observation cabin of R-100 before completion. This cabin is slung beneath the airship.



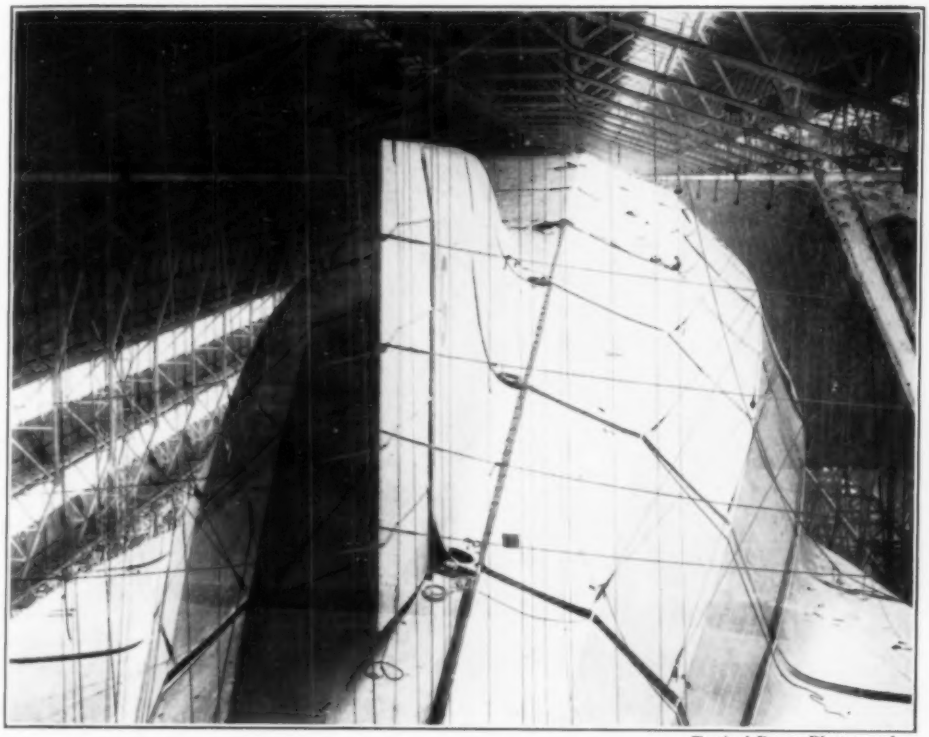
Topical Press, Photograph.

A tail view of the R-100 in its shed at Howden, Yorkshire, when the ship was under construction.



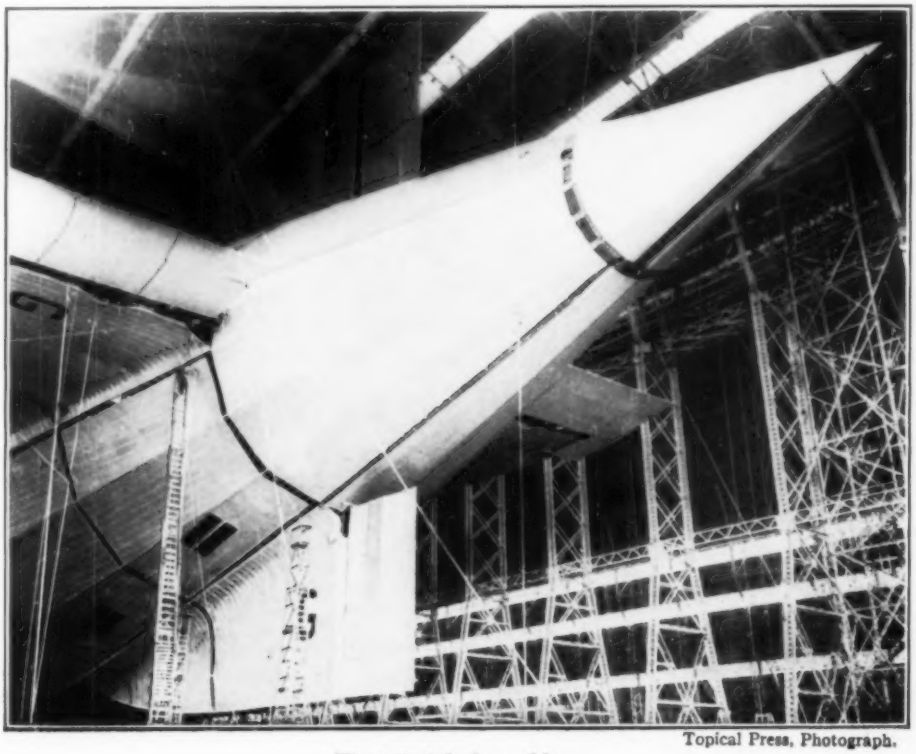
Topical Press, Photograph.

An interior view of the R-100 looking aft. None of the balloons or other internal equipment had been installed at the time the photograph was taken.



Topical Press, Photograph.

Looking down on the R-100 and showing a near view of the top rudder.



Topical Press, Photograph.

The tail of the huge ship.

Topical Press, Photograph.

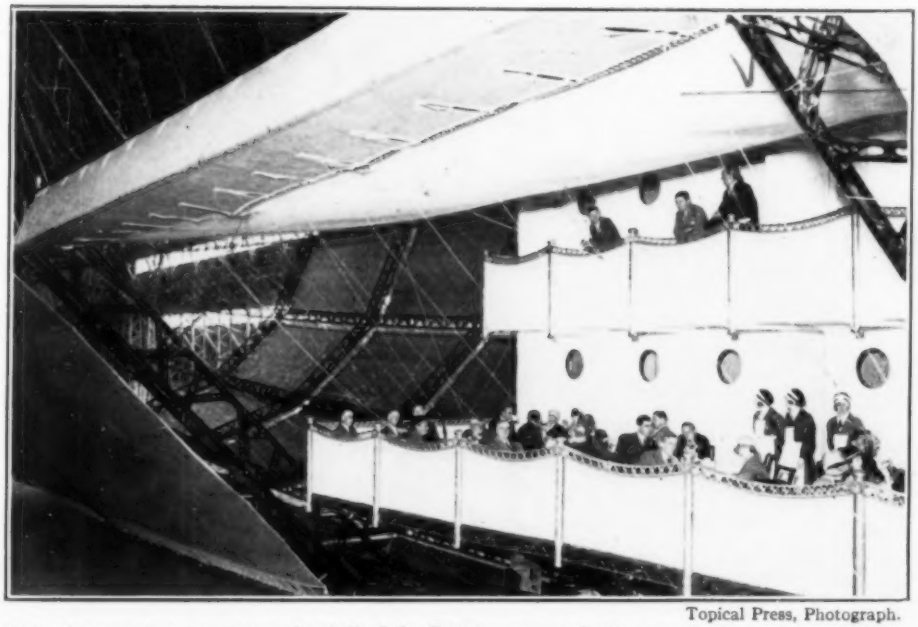
Visitors to the R-100 looking through the windows of the promenade in the centre of the ship.

Topical Press, Photograph.

What the kitchen of the R-100 looks like. The maid in the picture is merely posing. No women were carried on the trips of the R-100.

Topical Press, Photograph.

A meal in the dining saloon of the R-100.

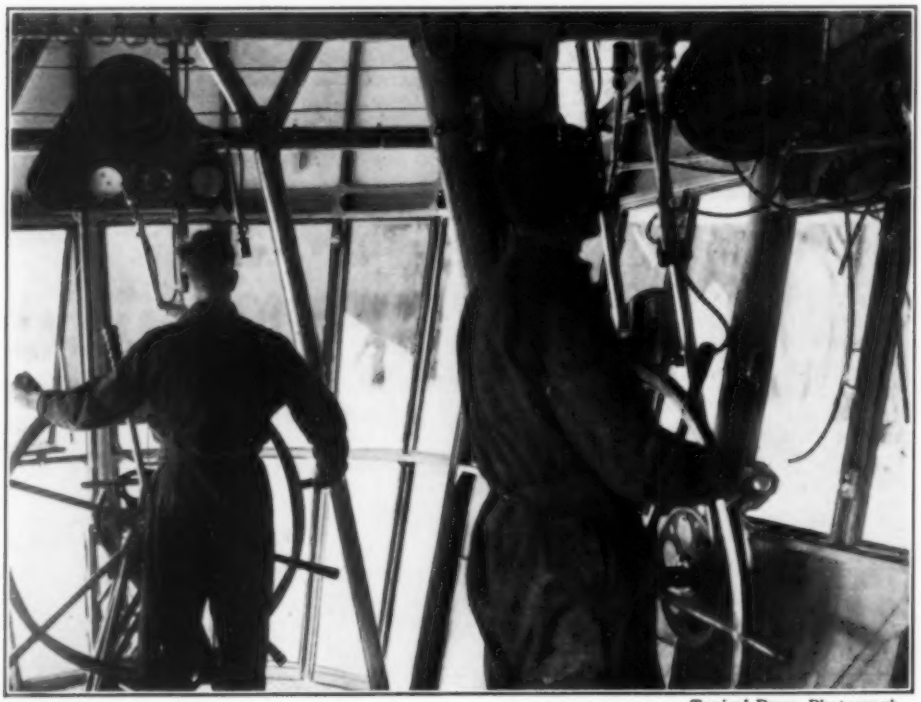


Topical Press, Photograph.

This photograph, taken before the shell of the R-100 was completely covered, shows the promenade deck for passengers.

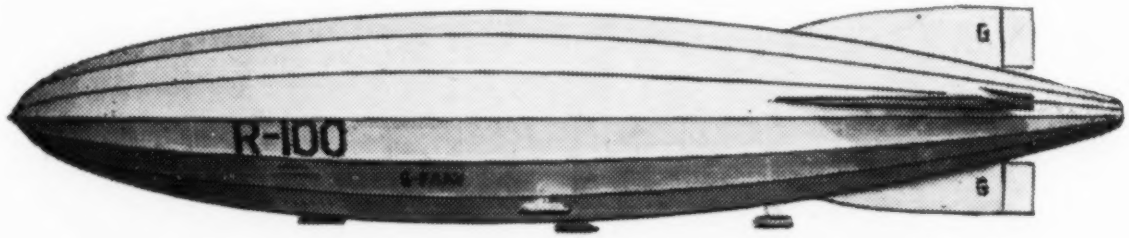
Topical Press, Photograph.

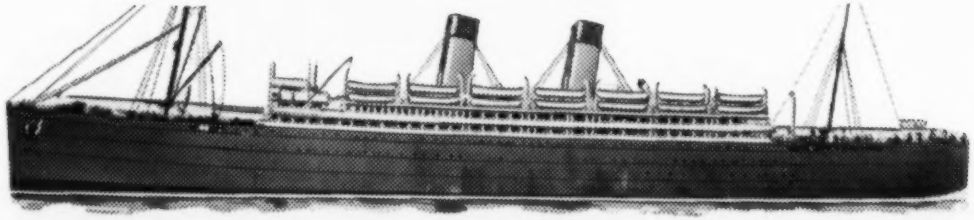
In the control cabin of the R-100, with an officer consulting dials and giving directions through a megaphone.

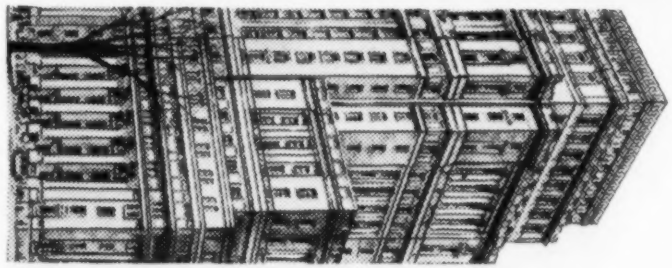


Topical Press, Photograph.

Helmsmen at the wheels in the control cabin.







White Star Line News Dept., Photograph.

The giant air liner, 709 feet long, is pictured above the White Star liner "Laurentic," the longest liner into Montreal, which is 604 feet from stem to stern. Just below is a tilted section of the largest building in the Empire, the Sun Life Building, in Montreal, measuring 405 feet in height and now nearing completion. The object at the bottom is a railway sleeping car, 70 feet long. All pictures are in scale, except the car, which is double the proper size so as to be distinguishable.

Topical Press, Photograph.

Two of the bunks in a sleeping cabin aboard the R-100. The cabins have a resemblance to those of steamships.

(*Continued from page 543*)

gas or vapour penetrating to the living quarters. Cooking is done out here in an electric kitchen. The passengers are quartered in two and four-berth cabins like those on an ocean liner. Windows in the side of the ship provide the light and the view, and these are faced by promenades sufficiently spacious to accommodate a pleasant little dance.

Below the crew's quarters of the passenger coach is slung the control car, an excrescence on the hull. Aft of the passenger coach the corridor narrows and becomes more spartan, being designed for the use of the crew only. One hundred and thirty feet aft of the coach we come to two engine cars suspended outside the hull. Each car contains two Rolls-Royce engines of 660 horsepower each and one A.C. motor car engine, whose function is to drive a dynamo to provide electric current necessary for lighting, heating, cooking and wireless.

Ninety feet aft of these engines, a third car, similar to the other two, is situated. Aft again, are the fins and rudders of the ship that serve the same purpose as the feathers of an arrow in assuring stability to its flight. There the corridor ends, and 90 feet aft again the ship comes to an end in a fine run tail.

Standard end-fittings are used throughout, and the whole construction has been ingeniously thought out to reduce the dissimilar parts in the ship to 42. There are not more than seven dissimilar parts in the whole of the longitudinal girders and only 13 different parts in the construction of the transverse frames. Yet each girder is curved to give a proper continuous streamline shape and the design, it is stated, is such that all loads in girders are either pure compression or tension. Throughout the ship, too, a system of grading the girders and shear wires has

been followed, the strength, and, therefore, the weight of each girder varying with the local strains in that particular area.

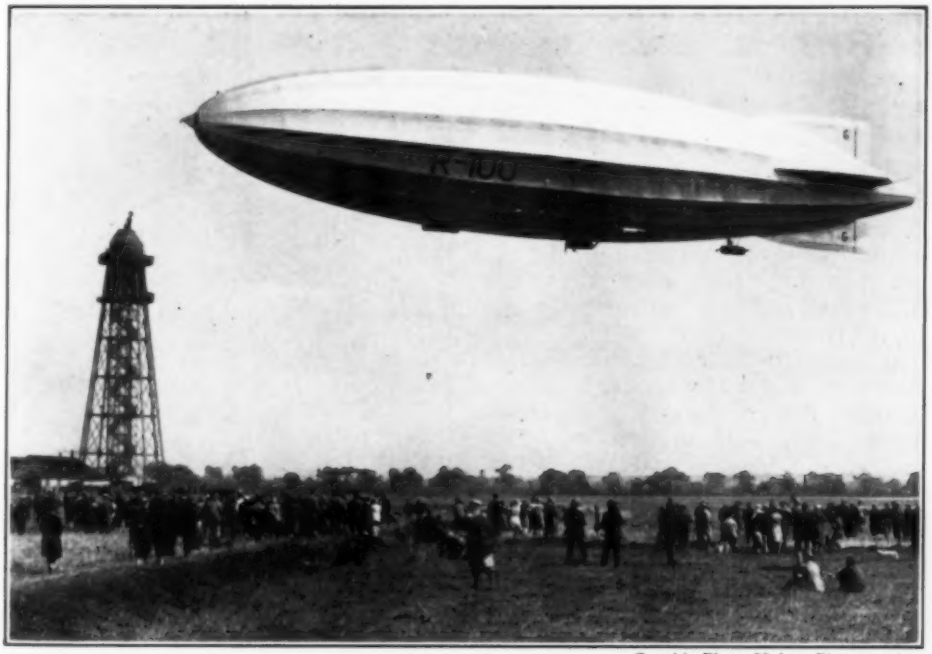
The R-100 framework is primarily of duraluminum while the principal members of R-101 are of high tensile steel. Although designed to the same specification as to performance, R-100 is totally dissimilar to R-101 and neither ship can be said to follow "Zeppelin Construction" in the least. The term "Zeppelin Construction" refers to the type of girder and method of joining them. Neither ship uses this method as the strength of the structure cannot be calculated, apart from other considerations.

The R-100 sailed from Cardington with 5.4 tons of water ballast aboard. She arrived in Montreal with 9.8 tons, showing that 4.4 tons had been collected during the 79 hour flight from England to Canada. Rain was not alone responsible for this fact, for water was gathered while passing through clouds. The moisture collecting on the top of the airship flowed towards the stern, where it encountered a tape that diverted the stream into special ballast tanks aboard. This was the first time that the experiment of collecting water had been attempted.

A further advantage was derived in the matter of financial saving. As fuel is burned by the airship's motors, hydrogen must be released to compensate for the loss of weight. If, therefore, additional water can be taken aboard to equal the amount of gasoline consumed, no hydrogen need be sacrificed. On her flight to Montreal, the R-100 used 29 tons of petrol, while only 4.4 tons of water were collected. It is apparent, therefore, that a considerable volume of hydrogen had to be released, though not an amount equivalent to the weight of gasoline burned up.

When gassed to capacity, the weight of hydrogen carried by the R-100 amounted to approximately 13 tons.

All comment of crew and passengers with regard to the flights agreed that, except for the brief period in the thunderstorm on the St. Lawrence, the R-100 rode the air with complete smoothness and that the only discomfort was to smokers in the rule against smoking, a discomfort to be overcome in future



Graphic Photo Union, Photograph.

Crowd cheering the R-100 on her return to Cardington from her flight across the Atlantic to Montreal.

Canadian Government Motion Picture Bureau, Photograph.

The city of Montreal, photographed from the R-100 by a Canadian Government photographer on board.

voyages by the provision of a smoking-room.

Nine other outstanding flights adorn the records of lighter-than-air flying, all of them have been made within the last 20 years, and four were made by one ship, the German Graf Zeppelin.

The list of notable flights follows:—

America—Piloted by Walter Wellman, attempted a trans-Atlantic flight from Atlantic City, N.J., in October, 1910. Wrecked off Cape Hatteras. Crew rescued.

L-57—German dirigible, flew from Jamboli, Bulgaria, to Daka Casis, East Africa, and back in 1917. Voyage of 4,200 miles took 96 hours.

R-34—British dirigible, flew from Scotland to Mineola, L.I., and back in July 1919. Distance of 6,200 miles, covered in flying time of 187 hours.

ZR-3 (Los Angeles)—German built dirigible for United States navy, flew from Friedrichshafen, Germany, to Lakehurst, N.J., in three days in October, 1924.

Anorge—Flew across north pole with Captain Roald Amundsen on May 12th, 1926.

Graf Zeppelin—Made first flight from Friedrichshafen to Lakehurst in October, 1928, in 111 hours, and returned in 69 hours.

Graf Zeppelin—Made second trans-Atlantic flight from Friedrichshafen to Lakehurst in August, 1929, in 95 hours and return flight in 54 hours.

Graf Zeppelin—Flew around the world from Lakehurst to Lakehurst, August, 1929, in 22 days.

Graf Zeppelin—Flew from Friedrichshafen to South America and back by way of Lakehurst in May and June, 1930, travelling 18,000 miles in 19 days.

Amongst the New Books

The Romance and Rise of the American Tropics. By Samuel Crowther. Toronto: Doubleday, Doran and Gundy. 1929. $5.

It was a very happy thought of Mr. Crowther's to have written this readable and informative account of the Central American Republics, and to have illustrated his text with so many excellent pictures. Most of us have a somewhat vague idea of Guatemala, Honduras, Costa Rica, Salvador and Nicaragua, and it is not at all easy to find much about their past or present outside the rather dry pages of encyclopaedias. The present book supplies that deficiency, and does it admirably. Mr. Crowther is an American, and writes from an American point of view, but for the most part his statements as to the very complicated international relations of this curious tropical neck of land that connects the two continents are eminently fair and reliable. Not the least interesting part of the book is the chapter which summarizes the narrative of John L. Stephens who, under instructions from President Van Buren, visited the infant republics in 1839. One is inclined to think these little countries turbulent and backward to-day, but they have travelled far since 1839, and much of that advance is unquestionably due to the enterprise of American engineers and men of business.

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Ryerson Canadian History Readers. Edited by Lorne Pierce. Toronto: The Ryerson Press.

In this excellent series of little books are included a number that belong to the department of Canadian exploration and travel. Each book runs to about 32 pages, and has one or two illustrations and a bibliographical note. Among those already published are: Jacques Cartier, by J. C. Sutherland; Marquette, by Agnes Laut; Du Lhut, by Blodwen Davies; Alexander Henry and Peter Pond, by Lawrence J. Burpee; Sir Alexander Mackenzie, by Adrian MacDonald; Simon Fraser, by V. L. Denton; Sir John Franklin, by Morden H. Long; Captain Cook, by Mabel Burkholder; Henry Hudson, by Lawrence J. Burpee; La Vérendrye, by G. J. Reeve; Champlain, by Adrian MacDonald; Iberville, by N. M. Rogers. Books to follow deal with David Thompson, La Salle, Radisson, Samuel Hearne, and Vancouver.

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America's England. By M. V. Hughes. London: J. M. Dent and Sons Limited. 1930. $1.75.

In this volume Mrs. Hughes has brought together the historical background of England that is peculiar and of particular interest to citizens of the United States. From the time of Cabot, to Henry Hudson, to Sir Walter Raleigh and his Virginian colonies, to William Penn and George Washington, the history of England that is linked with America is stressed. The main part of the volume is a useful and entertaining guide to England, and supplements the earlier "About England".

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The Romance of the Prairie Provinces. By A. L. Burt. Toronto: W. J. Gage and Company. 1930.

It is always a happy circumstance when one who combines the equipment of a scholar with the ability to write simple and readable English can be persuaded to write a book. That is what happened in this case. Professor Burt has put into 250 pages the story of the three Prairie Provinces, and he has justly called it a romantic story. Many of us are under the mistaken impression that the country between the Great Lakes and the Rockies has very little history, and that what there is of it is anything but romantic. Read this book and get a better point of view. It takes us back to the early days of the Hudson's Bay Company, to the expedition of Henry Kellsey in 1691, to the important discoveries of La Vérendrye half a century later, and to many stirring incidents that form part of the history of these Western Provinces.

Notes and News

Air Route from England to Canada Across the Arctic.

An expedition under the auspices of the Royal Geographical Society left London for Greenland in July. The purpose of the expedition was to obtain information with a view to establishing an air route from England to Canada across the Arctic regions with only 300 miles over the sea. The Canadian terminus would be Winnipeg. Conditions in Hudson Strait had been thoroughly ascertained through flying operations conducted by the Department of Marine and radio stations established throughout the region.

* * *

Search for Relics of Sir John Franklin.

Since the year 1845 when Sir John Franklin started on his last voyage, no one has ever made search for any remains of the expedition on the west shore of King William Island when snow was off the ground. Such a search has this season been made by Major L. T. Burwash of the Department of the Interior. For about two or three weeks at the end of August the old snow has melted and the new has not arrived, leaving the ground more or less clear for inspection. Major Burwash flew from the mouth of the Coppermine River to King William Island, where a thorough examination of the ground was made especially at Victory Point on the west shore, when the snow had disappeared, for any relics of Sir John Franklin, such as ship's papers. Before arriving at King William Island, Major Burwash left Norman on the Mackenzie River and flew over Great Bear Lake to the Coppermine for the assistance of any prospectors who might have entered the region. This mineralized area had been declared open for prospecting from July 1st, 1930, and a number of parties were expected to visit this region, first explored by Hearne in 1770-1772.

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Patricia District of Northern Ontario.

Was visited in July by two seaplanes under direction of the Royal Canadian Air Force in collaboration with the Department of Indian Affairs and the Provincial Government of Ontario. Leaving Ottawa the first stop was at Remi Lake and thence the chief Hudson's Bay Company posts were visited where the annual payment of treaty money was made to the Indians. In previous years these payments of treaty money were effected only with extreme difficulty by canoe. The planes then proceeded to Fort George carrying back an Indian boy who had been brought to Ottawa for treatment resulting from gunshot wounds. From Fort George the planes continued north to the Belcher Islands which were inspected as thoroughly as possible.